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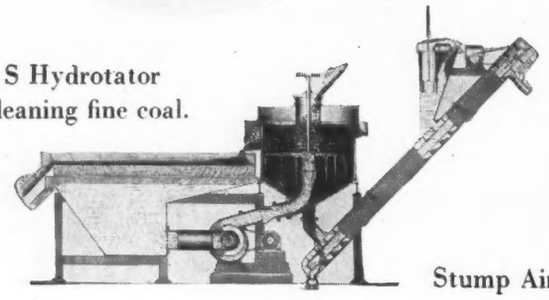

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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

MAY, 1947

Ivan A. Given, EDITOR

The Better Road

ARBITRARY, capricious and illegal action from the outside has been one of coal's major burdens for more a decade. Until recently, those responsible—union leaders and federal officials—combined forces against the operators. Now, they are enemies. But whatever the lineup, the public, with the miner and the operator, have suffered the inconvenience and paid the cost.

The April safety strike and the federal countermove were the latest examples of fiat action in situations crying for thoughtful, reasonable procedure. However, by focussing increased attention on a major coal problem, a solution will be promoted, although it is a fair question whether the same goal could not have been attained by methods other than those growing out of a grudge fight. Both the administration and union leadership, after throwing the spotlight on each other's failures, wound up by advocating federal compulsion in safety. Both forget that, fundamentally, merely passing laws and building up the power of the state—or of union leaders—are not the major answers to safety. If they were, no driver would have to feel in any way responsible for the safe operation of his car. He could get in and take off, relying on the government for everything thereafter. Such an approach naturally is silly, but it seems to be the thinking of federal officials and union leadership on mine safety—unless, as might be surmised, their real goal is more power over the industry. Laws, fiat action and welfare funds do not produce safety. Hard work, education and selling—convincing the individual that safety is vital and showing him how to get it—are the major ingredients. That is the way operators and safety men have been getting results that will last.

How soon the coal industry will again have an opportunity to function free of political interference still was a question when this was written. Theoretically, the mines will revert to their owners June 30. The word "theoretically" is used advisedly in view of the known itch of a number of federal officials for authority over the industry, the plans of union leadership and the continuing disposition of the administration to appease labor leaders and resort to seizure when excessive union demands become embarrassing. In short, there still is the chance that federal officials will try to hold the mines if, as now seems the case, union leadership goes all out for a victory on its own terms.

How soon, also, the coal industry will be able to get back to something approaching fairness, reasonableness and regard for the public interest in contract making, contract keeping and general relations with union leadership also was a question at the time of this writing. The major obstacles remain arbitrary leadership and administration attitude. They are real obstacles and the leadership one, particularly, may require time to eliminate. But there are signs that coal mining and other hard-pressed industries will get some measure of relief.

In working for the establishment of a fairer basis for relations between employers and labor leaders, Congress undoubtedly is reflecting public impatience with past excesses. Not only that, indications are that even union members are beginning to question the tactics of their leaders. These attitudes are foundations on which industry can build. It can build by increasing its efforts to deal fairly and reasonably with employees, by sharing the facts with them, by exerting every effort to make working and living conditions as safe and satisfactory as possible and—most important of all—by keeping the public interest always foremost. That is the better road not only to safety but to maximum advancement of public, industry and employee interests. It is the road federal officials and union leadership should be helping build.

COAL AND CHEMISTRY: Foundations for New Industries

With all hydrocarbon fuels technically interchangeable, coal stands much nearer the day when big tonnages will go into gas and synthetic liquid fuels. What the prospects and processes are, including underground coal gasification, are summarized in the following.

SINCE COAL is mostly carbon and carbon has become one of industry's most important building blocks, the coal industry has been in line for better things through chemistry and chemical engineering for some time past. However, the date when coal will begin to benefit significantly as a supplier of carbon for chemical processing and as a distributor of material having carbon as a base has been brought appreciably closer by the recently announced program of the Pittsburgh Consolidation Coal Co. (April *Coal Age*, p. 130) for the development of processes and plants for the production of oil and gas from coal.

Factors Favoring Coal

The reasons why coal is now approaching the time when it will bulk large as a supplier of carbon for the products of chemistry and chemical engineering are several. Among them are:

1. More exploration and steady improvement of processes for converting carbon in the form it exists in coal into liquid fuels, gas and other products now so important in national and world economies, plus increased research and pilot-plant investigations, such as the Pittsburgh Consol-Standard Oil of N. J. program embraces. Research and development already have brought the cost of liquid fuel from coal down to within shooting distance of the price of gasoline from petroleum.

2. The greater need for alternative sources of liquid fuels as a result of the growing difficulty in maintaining the reserves of petroleum in the United States.

3. The growing cost of liquid fuels and other petroleum products, which enhances the possibility of commercial competition from alternative products made from coal or produced from other sources, such as shale, tar sands, etc.

4. The fact that all the hydrocarbon fuels, which include coal, oil and natural gas, are becoming technically interchangeable, meaning that coal has a much better chance of substituting for other types through conversion at costs making coal products competitive.

One should hasten to say, however, that coal will not cut the melon tomorrow. Much research and experimentation remain to be done, money found, plants built, and so on—always in the face of the advantage petroleum and natural gas enjoy as a result of an established position. Then there is the cost of coal. If it keeps going up, the difficulty of arriving at a competitive cost is prolonged—a matter of real concern not only to management faced with tough competition but also to miners in the same boat.

Atomic Power Still Remote

Finally, there is atomic power—a possibility as a competitor but still a rather remote one. Atomic power so far is considered more a supplementary source of energy and the tendency is to put the date when it might begin to provide energy in any substantial volume farther off rather than closer. Even if it were closer, the chances of atomic power taking over the liquid-fuel business—the big prize—is, at this time, consistered practically non-existent.

U. S. Bureau of Mines

Gasoline and other liquid fuels are made from synthesis gas provided by coal in the Fischer-Tropsch process, employed in this bombed German plant and regarded as the leading contender for first place in the coming fuel revolution in the United States.

So coal, fundamentally, holds the inside track because of (1) available reserves, (2) ability to supply low-cost carbon, (3) the limited reserves, relatively speaking, of petroleum and natural gas, and (4) the increasing necessity of making sure that the United States can continue to maintain its independent status in fuel supplies, regardless of the type.

If coal, as now seems highly likely, can produce low-cost gas and liquid fuels, it not only can open up a new market but also will provide itself with the new weapon in the battle for present fuel markets —particularly domestic, railroad and steam. Since research efforts are becoming increasingly effective, there is little reason to despair of coal's future as a supplier of solid fuel in spite of stiffer competition. But if coal, through chemistry and chemical engineering, by conversion of its product to a liquid or gaseous form at a competitive cost, can crack markets not now open to it, it also will have something else to offer a user dissatisfied with coal for any reason.

Market Potential Big

The prize in the coal-conversion race is no mean one. Theoretically, it is the complete oil and natural-gas markets, which are equivalent, respectively, to approximately 450,000,000 and 160,000,000 tons annually at the present time. The practical goal, however, is considerably less, since, for geographic and other reasons, petroleum products and natural gas will continue as significant factors in the fuel market for any foreseeable time.

What coal can reasonably expect to have a chance at, however, still is substantial from the standpoint of tonnage alone, not to mention other income possibilities. Giving due weight to geographic and other considerations, the goal for coal might be a minimum of 250,000,000 tons annually in replacing petroleum products, plus a minimum of 50,000,000 tons annually in replacing natural gas, on the basis of a straight coal-for-competition equivalent. As a matter of fact, however, the tonnage involved would be considerably greater, considering that the conversion process does not transform all the coal into liquid or gas. What the proportion will be will depend upon further research, but it is scarcely to be expected that a straight coal-for-oil or coal-for-gas transformation will be possible. If, in addition to the extra tonnage, coal owned the processing plants and distributing facilities, it could expect to benefit from the higher, more-stable income normally accruing from sales directly to the ultimate user.

At this point, a question about oil shale and other sources of liquid and gaseous fuels might be in order. They are, of course, possible alternatives, and active exploration of the questions involved in the production of liquid fuels from shale is now under way. However, developments in the chemical processing of coal are leading some authorities to relegate oil shale and other sources to a secondary position as possibilities, but commercially unlikely any time in the near future. Coal processing now offers the major possibilities from the cost standpoint and coal exists in ample quantities where the demand exists.

Coal-Conversion Methods

How and by what process or processes will coal be transformed into these new contenders for the country's fuel market? The basic fact is that, chemically, all the major fuels are varying combinations of carbon and hydrogen. Coal is mostly carbon, with about 5 percent hydrogen. Heavy oil contains three times as much hydrogen and gasolines considerably more.

Combine gasified coal with water vapor (steam) at specific temperatures and pressures. Do it in the presence of one of several metallic catalysts. The coal will then take up hydrogen from the water (or hydrogen from another source) and thus upgrade itself.

Perhaps the earliest of all methods of getting gaseous and liquid fuels—particularly the former—was heating a suitable coal to drive off the volatile constituents. Producer gas, involving a definite chemical reaction (the production of carbon monoxide by burning coal with insufficient air for complete combustion), came into existence in the early 1800's. A mixture of carbon monoxide with the nitrogen from the air, producer gas has a B.t.u. content of around 120 per cubic foot and is used in some industrial processes where a "lean" gas is satisfactory.

The process now looked upon as one of the foundations for the production of oil and gas from coal was perfected commercially in the United States in 1873. Known as the "water-gas" process, it consists of heating coal or coke to a glowing state and then introducing water in the form of steam. The oxygen in the water, or steam, combines with

the carbon of the coal or coke to produce carbon monoxide, making a "water gas" consisting of carbon monoxide mixed with the hydrogen left over from the water.

Enriched with petroleum to raise the B.t.u. content from about 300 to something over 500 per cubic foot, water gas, along with gas from byproduct coke ovens, is at present the mainstay of the manufactured-gas industry. In coking, of course, there also is produced a certain quantity of liquid fuels and other products, although the process scarcely could be called a chemical reaction.

Both the producer and water-gas reactions take place at atmospheric pressures, although at elevated temperatures, approximately 2,500 deg. F. in the producer-gas reaction and 1,800 deg. F. in the water-gas reaction. Slightly over 70 percent of the solid fuel is converted to gas in the producer reaction and slightly over 60 percent in the water-gas reaction.

Hydrogenation First Step

It is when pressures are raised and catalysts are employed to make carbon and hydrogen combine that the modern products competitive with petroleum begin to appear. The first major step grew out of the work of Friedrich Bergius, a German, who introduced hydrogen into a coal paste in 1910 at a temperature of 850 deg. and a pressure of around 3,000 lb. per square inch. In the presence of a metallic catalyst (several have been used), Bergius got something over 40 percent of the coal out in the form of gasoline, diesel oils, lubricating oils, waxes, and so on.

While it was a major step forward, the Bergius "hydrogenation" process, brought into commercial operation in 1927, was soon challenged (in 1933) by a process of reacting carbon monoxide with hydrogen, in the presence of a catalyst, at relatively lower temperatures and pressures (up to 650 deg. F. and 250 lb. per square inch), to produce gasoline, diesel fuel, lubricating oils, synthetic alcohols, waxes, and so on. Developed by two other Germans, Franz Fischer and Hans Tropsch, the Fischer-Tropsch process now is considered by many authorities to be the leading contender for first place as the foundation of the coming synthetic-liquid-fuel industry. It is now believed that gasoline can be produced by the Fischer-Tropsch process at as low as 7 to 8c. per gallon, compared to 15 to 18c. (again estimated) with the Bergius hydrogenation process and 3 to 5c. for petroleum refining and cracking. In the Fischer-Tropsch process, some 45 to 50 percent of the coal appears in the final product, against slightly over 40 percent appearing on completion of the Bergius process.

Hydrogen, it will be recalled, is essential to both the Bergius and Fischer-Tropsch processes. The old water-gas reaction produced not only carbon monoxide but also hydrogen. Consequently, needing hydrogen badly at a low cost, the Germans began a search for ways of improving the water-gas process to make it continuous rather than intermittent. The answer was feeding the producer with oxygen rather than air with its 79 percent of inert nitrogen. This, in turn, precipitated a search for a cheap method of producing oxygen, which was found in the fractional distillation of liquid air—the Linde-Frankl process. This made possible the continuous water-gas reaction by the Winkler process, providing the Germans with the cheap hydrogen they desired.

In the course of their investigations, however, the Germans found that carrying out the water-gas reaction at elevated pressures and temperatures (around 300 lb. per square inch and 1,800 deg. F.) resulted in a gas with a much higher B.t.u. content as a result of a supplementary reaction between part of the carbon and carbon monoxide and the hydrogen, producing methane. Known as the Lurgi, this process converts about 80 percent of the coal into a gas consisting of a mixture of carbon monoxide, hydrogen and methane, with a B.t.u. content of over 500 per cubic foot, compared to approximately 1,000 for natural gas, which is primarily methane.

Lurgi Process

The Lurgi process is regarded as a most promising building block in the coming gas and liquid-fuel industries. The gas is rich enough for use as is and future research may introduce modifications making it even better. Also, the Lurgi process provides the basic items—carbon (from carbon monoxide and methane) and hydrogen—employed in the most promising process for making synthetic liquid fuels, lubricants and other products. Lurgi and Fischer-Tropsch in one plant thus offer either gas or the raw materials for synthesizing liquid fuels. A flexible plant producing either gas or liquid fuels or both is the goal in the Pittsburgh Consol. program.

Gas From the Underground

The Lurgi or some other process is not, of course, the sole source of regular gas or gas for synthesizing purposes, commonly called "synthesis gas." Natural gas, as noted, already is slated for such use. However, a possible new source of regular or synthesis gas is the gasification of coal in the ground on the "producer-gas" or "water-gas" principles. The first step toward the exploration of the possibilities of such gasification in the United States was taken Jan. 21 at the Gorgas (Ala.) mine of the Alabama Power Co. under the direction of Milton H. Fies, manager of coal operations, H. M. Johnstone, manager, Gorgas coal mines, and other company officials, in conjunction with the U. S. Bureau of Mines and the Southern Research Institute. The following abstract of the work at Gorgas is taken from a report by J. V. Hightower for *Chemical Engineering*, a McGraw-Hill magazine.

The work at Gorgas was initiated by Mr. Fies and other company officials in 1946 and is being carried on in a finger of coal cut off from the main body by a trench. Two major considerations led to the selection of this particular coal body for an experiment in sustained controlled underground gasification of coal. For one thing, it was necessary that the experiment be conducted in a body of coal that could be isolated from the main bed easily and safely. Likewise, it was desirable to choose a coal section with a relatively shallow overburden that could be conveniently stripped off for examination of the conditions resulting from the gasification run.

In choosing a coal bed that satisfied these considerations, it was necessary to incur the disadvantages of a light overburden (30 ft.) with the consequent possibility of

burnouts. This limited air input to around 1,400 c.f.m. at a 1.5-lb. pressure. This in turn kept the equilibrium temperature during air blasting to approximately 1,250 deg. F., with the result that the heat content of the gas during air-blast operations was held to 50 to 80 B.t.u. per cubic foot. Inability to maintain the desired higher temperatures also was reflected in the relatively low heating values of the gas produced in runs of the water-gas type.

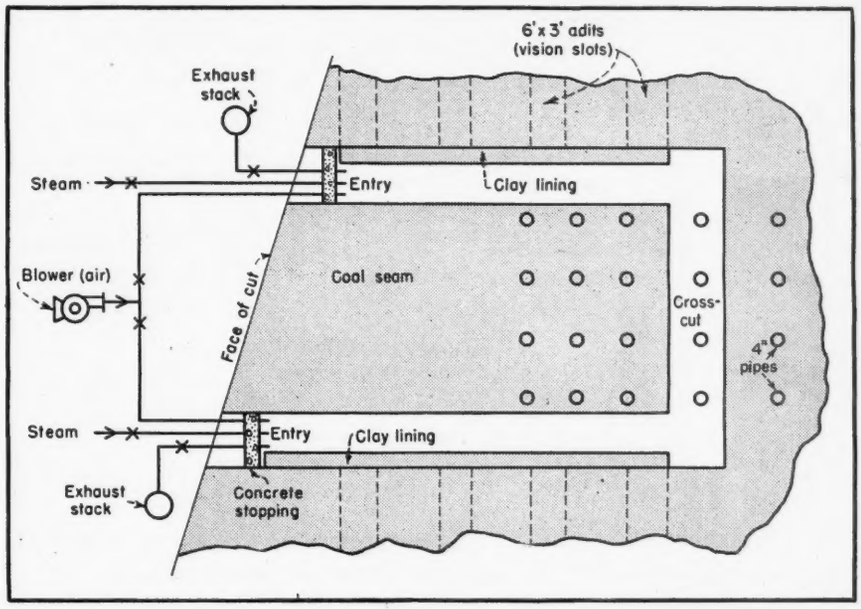
U-Shaped Duct Cut

In the finger selected for the Gorgas experiment, the 36-in. seam was prepared by driving a U-shaped combustion duct, consisting of one heading 140 ft. long and another 170 ft. long connected by a 40-ft. crosscut. Size of the headings and crosscut was 6 ft. wide by 3 ft. high. Bags of clay were placed internally along the walls of the headings for the greater part of their length to reduce the tendency toward burnouts. A 24-in. pipe from the air blower, a 2-in. steam line and a 24-in. pipe leading to an exhaust stack approximately 40 ft. high were inserted in concrete stoppings in the openings of each entry. As indicated in the accompanying simplified plan view, the piping arrangement was such that air or steam could be injected into either of the two headings, with the combustion gases leaving through the stack at the opposite end. Provision was made for this alternate type of flow to minimize the unequal consumption of coal.

Combustion was started by dropping incendiary bombs through 4-in. pipes sunk vertically through the overburden and adjusted so that the bombs fell upon loose coal in the crosscut. Provisions were made for viewing ports and for determining pressure, temperature and composition of gases at various points.

As noted, several types of operation were carried out at Gorgas, although the principal work was directed toward air blasting to manufacture producer-type gas, with alternate runs with steam and oxygen to produce water gases. Some data indicating the character of the gases have been released by Alabama Power officials, who emphasize, however, the previously noted limitations on air input and its injurious effect on gas quality.

In one air-blast run, during which it was estimated that gas production was at the rate of 1,400 c.f.m., the heat content of the product, largely made up of nitrogen from the air, was 55 B.t.u. per cubic foot. A steam run of about two hours, with a gas production of about 220 c.f.m., produced a water-type gas with a heat content of 222 B.t.u. per cubic foot. One run with 40-percent steam and 60-percent oxygen, lasting about three hours, produced gas at a rate of about 1,000 c.f.m. However, the nature of the equipment for vaporizing the oxygen limited input to about 200 c.f.m. Consequently, the heat content of the gas was only about 150 B.t.u. per cubic foot.



In a small finger of coal cut off from the main seam, the Alabama Power Co. made this set-up for a preliminary test of the possibilities of underground coal gasification.

Following completion of the gasification runs, plans called for stripping the overburden and examination of the burned area for further data.

Gorgas Test a Guide

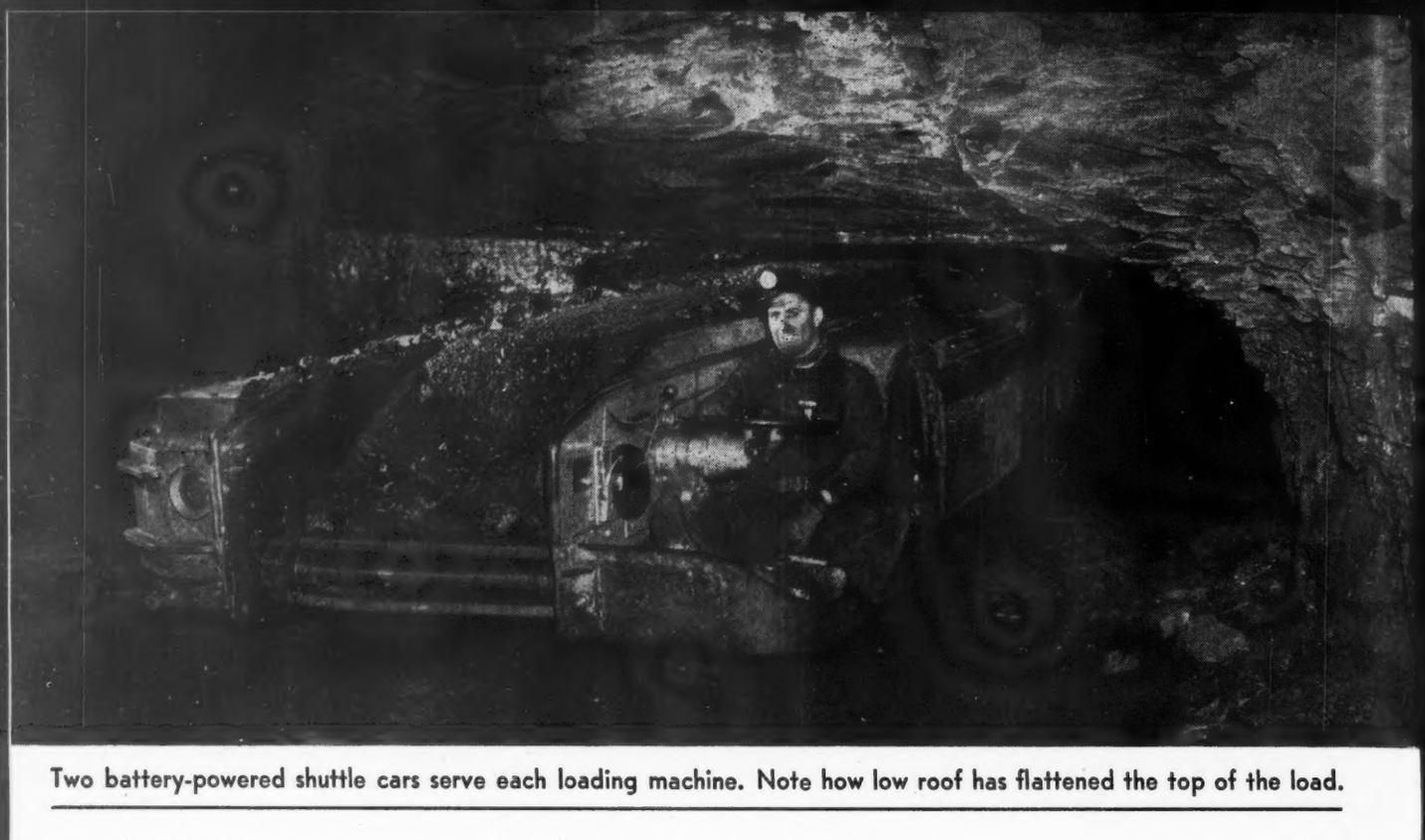
Despite the handicaps encountered, it is expected that the Gorgas work, or later efforts at other locations, will yield valuable information on the operating problems, types and quantities of useful products and costs. The Gorgas project is regarded primarily as a fact-finding experiment to determine the practicability, in the United States, of a process that already has been applied commercially in Russia and soon will be tried in an abandoned mine in Belgium. Russian plans call for gasification at a rate of about 100,000,000 cu.ft. per day by 1950. Currently, the chief interest in the work in Alabama is the study of engineering problems and the completeness of the conversion of the coal.

From the ultimate viewpoint, the investigation is regarded as important for the light it is expected to throw on the practicability of underground gasification as a means of producing gas for boilers, gas turbines and the manufacture of synthetic fuels and other chemicals. It is thought unlikely, however, that the Gorgas project will be more than a preliminary effort leading the way to later development.

Coal's Future Bright

Coal's problems for quite a few years have included the major one of beating off competition from petroleum and natural gas. Now, with the benefit of the principal reserve of carbon, it can see, through chemistry and chemical engineering, the day when it will be the major source of gas and liquid fuels.

The plum, however, will not fall into the industry's lap only for the wishing. Much work remains to be done and much money must be invested in research and in plant construction before that day is completely reached. In addition, the industry has the problem of deciding soon whether it wants to get the added returns from owning the processing plants and selling to the ultimate consumer—a problem of assembling the large individual capital outlays such plants and distributing facilities would require. In any event, the growth of the gas and synthetic liquid-fuel industries confidently to be expected will bring the coal-mining industry substantial tonnage increases not in the misty future but relatively soon.



Two battery-powered shuttle cars serve each loading machine. Note how low roof has flattened the top of the load.

DEVELOPMENT CREW
Loads 25 Tons per Man in 42-In. Coal

Loaders Served by Two Shuttle Cars in Driving Five- and Seven-Heading Entries at L. C. S. — Shortened Haul, Grade Elimination, Power Boost and Heavier Rail Promote Efficiency—Tons per Injury Doubled

MULTIPLE - HEADING development with loaders serviced by two shuttle cars nets 20 to 25 tons per man in 42-in. coal at the Virginia No. 14 mine of the L. C. S. Colliery, Inc., Heshbon, Indiana County, Pa. Eliminating a haulage bottleneck by rerouting the haulage circuit across an old territory and through virgin coal and doing away with one 7-percent grade was among the improvements enabling L. C. S. to qualify for the *Coal Age* Coal-for-Victory award. When the new rectifier station is moved inside the mine close to the center of the load, production is expected to increase and the heating of motors and cables will be reduced.

The present development plan calls for five and seven headings for an entry-driving unit in opening new territories in the 42-in. "B" or Miller seam, which dips about 2 percent. Main entries consist of seven headings; panel entries, five to seven. The number in both cases formerly was two. The seven-heading scheme has three headings, on 60-ft. centers, to the right and left of a middle heading. Crosscuts on a 45-deg. angle, at 90-ft. intervals, connect the respective headings on each side with the middle heading. The crosscuts are staggered. Therefore, a crosscut stems from the middle heading every 45 ft. All main headings, except the middle one, are driven 20 ft. wide. Crosscuts are driven 14 to 15 ft. wide. The middle heading, which is to accommodate the track later, is narrowed to 12 ft. and 3 to 4 ft. of top is taken for height. This top is shot down and loaded on the third shift so as not to interfere with the regular production on the other two shifts.

Rooms, 21-ft. wide on 50-ft. centers, are turned off the panel entries at either 60 or 90 deg. to take advantage of the grades for the shuttle cars. The panel entries are driven up first. Then, depending upon local grades, 300-ft. rooms are driven on one or both sides of the panel entries, on retreat. Pillars are mined and extraction is about 85 percent.

The 3 to 4-in. layer of bony coal overlying the 42-in. seam is difficult to hold up. When it comes down with a fresh fall, two muckers precede the loading crew and pick off all the bony that is visible. Much of it is piled in front of the fall where the loader disposes of it by running it up on the rear conveyor and gobbing it against the left-hand rib. While this is time lost, especially for the loader and shuttle cars, it is being done until better preparation and gob-disposal facilities are available at the tipple.

Later, the management expects to have the bony, which will aggregate 8 or 9 percent by volume, loaded along with the rest for separation at the tipple. This arrangement should result in an over-all improvement in production.

Eleven Men Serve Loader

The eleven men comprising a machine crew are as follows: loader and helper, cutter and helper, driller, two muckers, timberman, two shuttle-car operators and an elevator operator. The cycle of operation is:

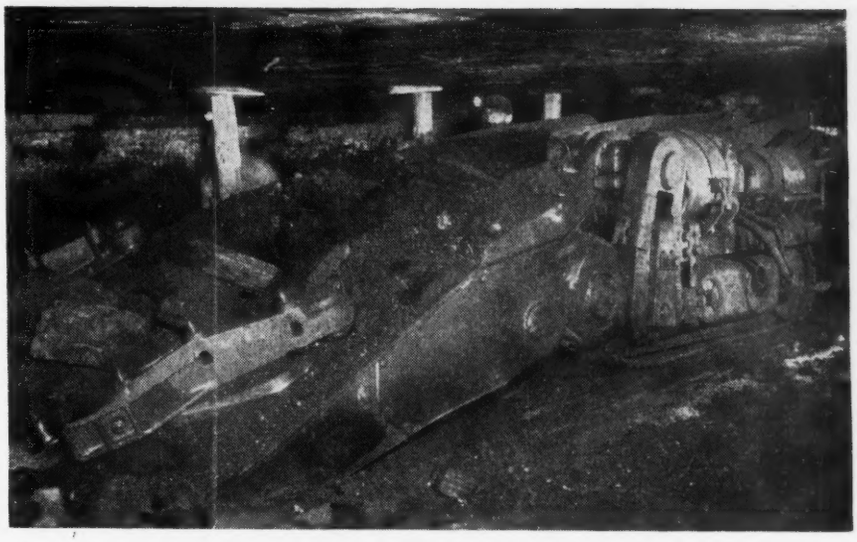
1. The timberman examines the roof and sets any posts necessary. In the 20-ft. headings two rows of posts are maintained, one on each side of the travelway for the loader and the shuttle cars. No crossbars are used.

2. The face is undercut, drilled and shot by a three-man crew (cutter, helper and driller). A Goodman shortwall cutter equipped with a 9-ft. Bowdil bar, chain and bits is moved on a low-pan Type T2-SPE Joy mining-machine truck. Chicago-Pneumatic No. 571 hand-held drills are standard equipment on all the sections. Four holes are drilled in the 20-ft. places, and three in the others. All holes are started 12 in. below the bony and pointed up to touch the bony at the back of the 8½-ft. cut. Each hole is loaded with four sticks of Lump Coal CC permissible.

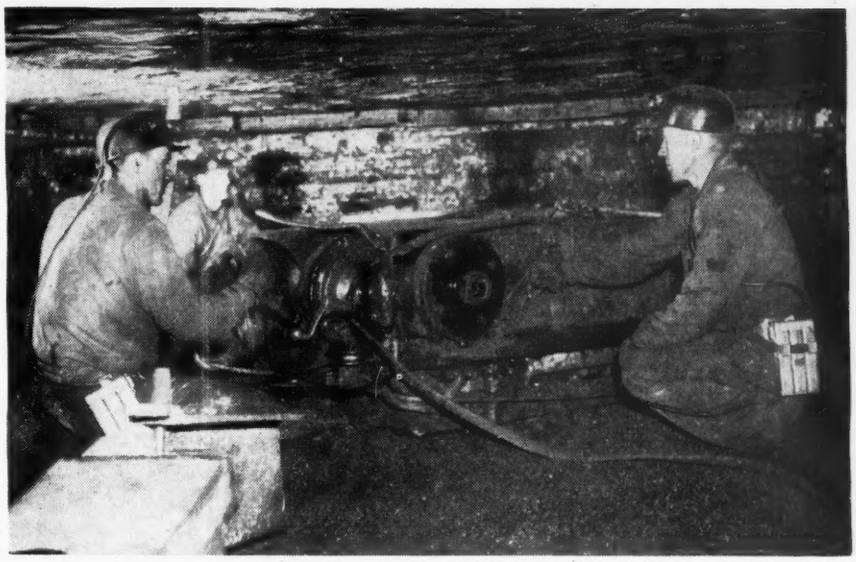
3. Two muckers clean off the bony coal that comes with each fall before the loading crew moves in. The Joy loading equipment consists of two 14 BU and one 12 BU units. Each 14 BU is serviced by two 4-ton Type 32D9P Joy battery-powered (Gould) shuttle cars. A 4-ton Type 32E6 car, also battery-powered, serves the 12 BU loader. All these rubber-tired cars are of the two-wheel-steer two-wheel-drive type. The shuttle-car haul does not exceed 400 ft. (one way), which, of course, is in keeping with one of the cardinal principles of mechanized mining, namely: keep the secondary haulage to a minimum.

4. The eleventh member of the crew is stationed at the shuttle-car-to-rail transfer station to operate a Type PL11-14RE Joy elevator and to inch the trip along with the Brown-Fayro trip hoist. Another of his duties is to reset the 600-amp. General Electric circuit breaker for the section when it trips on an overload.

During the war, the 1½-ton all-steel mine cars were replaced by 2-

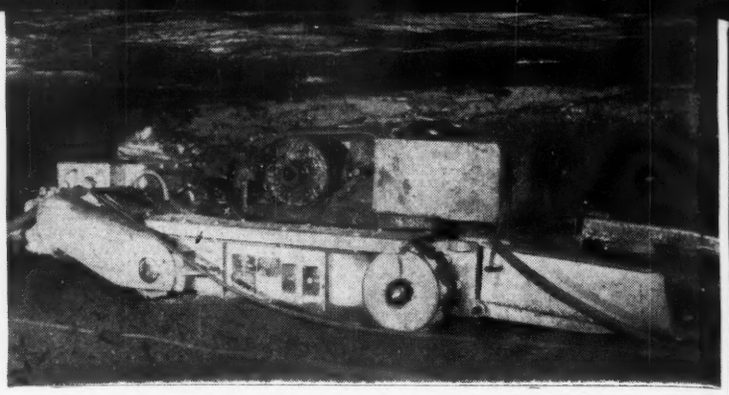


Each of the three loaders is fitted with permissible equipment.



The cutter, helper and driller prepare and shoot as many as 14 places each shift.

Coal is transferred from the shuttle cars to mine cars at the elevator station in the middle heading, where 4 ft. of top has been taken down.



Each shortwall is moved on a low-pan mining-machine truck.

The elevator man is included in the 11-man crew assigned to each section.

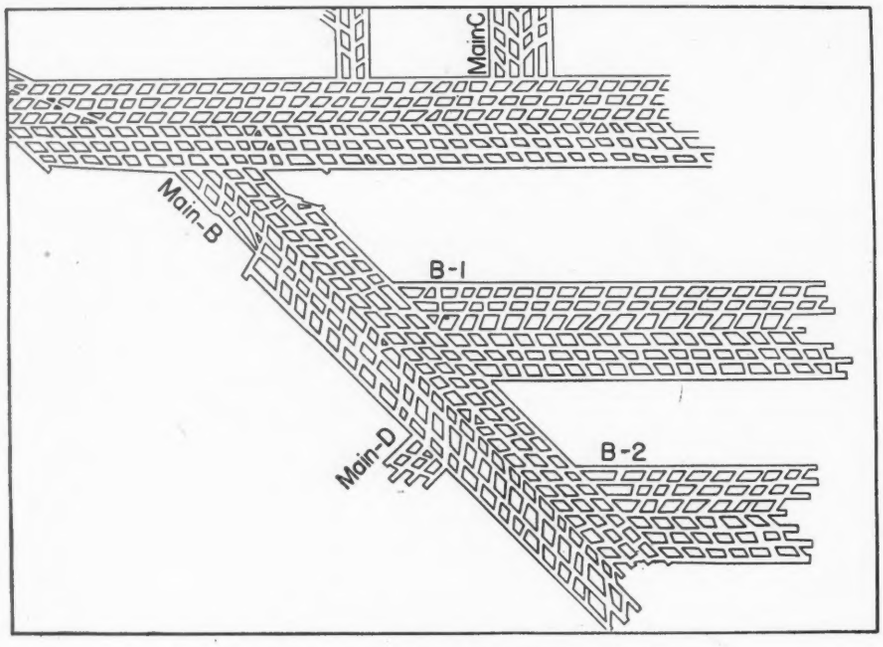


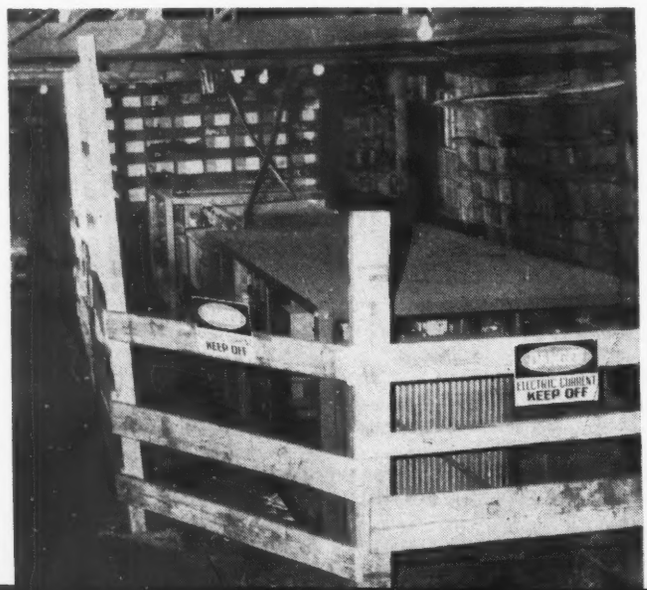
Fig. 1—Typical plan used in the seven-heading development.

ton wooden cars with steel reinforcing. All-steel cars were not available. About the same time a change was made on the rail-haulage system. A new drift mouth was constructed and a new main haulage was driven from this drift about 5,000 ft. to the present working sections. This shortened the haul and eliminated a 7-percent grade against the loads, thus increasing the efficiency of the haulage and reducing maintenance. Trips are hauled by a 10-ton 13-ton-equipped Jeffrey locomotive. Other improvements in the system include the replacement of 30-lb. rails with 60-lb. track, both rails bonded and cross bonded; replacement of 4,000 ft. of 2/0 and 4/0 trolley with No. 9 section; and the installation of 5,000 ft. of bare 500,000-cir. mil cable as a positive feeder.

Rectifier Helps Face Voltage

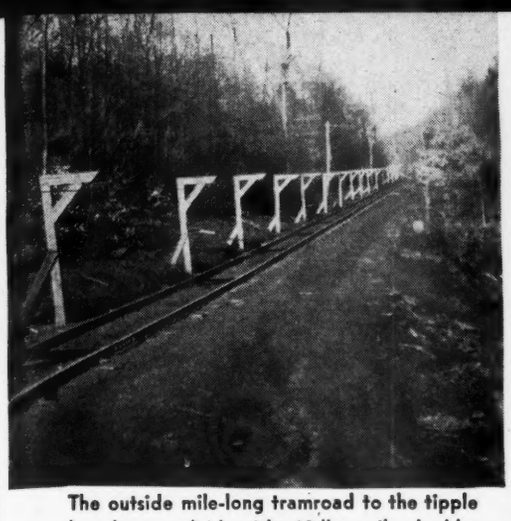
Ample substation capacity is always important to any highly mechanized operation and this fact, too, has been recognized at Virginia No. 14. In 1946, 150-kw. and 200-kw. motor generators were replaced by a 300-kw. sealed-tube ignitron-type General Electric mercury-arc rectifier. At present, this three-car unit, complete with safety inclosure, serves the operation from a temporary location near the drift mouth. Shortly, the rectifier is to be moved inside where it will be close to the center of the load. This move will raise the face voltage, even under conditions of heavy load, by some 80 volts. Then the mining equipment will operate closer to normal operating speed and, in all probability, it will require less maintenance.

Tonnage per lost-time injury at Virginia No. 14 has more than doubled in the period of 1943 to 1945. In 1943, tons per lost-time injury were 6,098; 1944, 11,346; 1945, 13,-

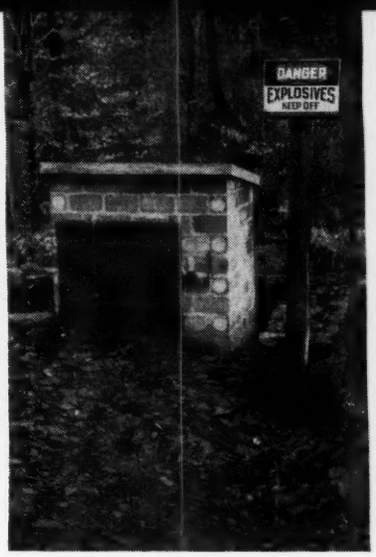


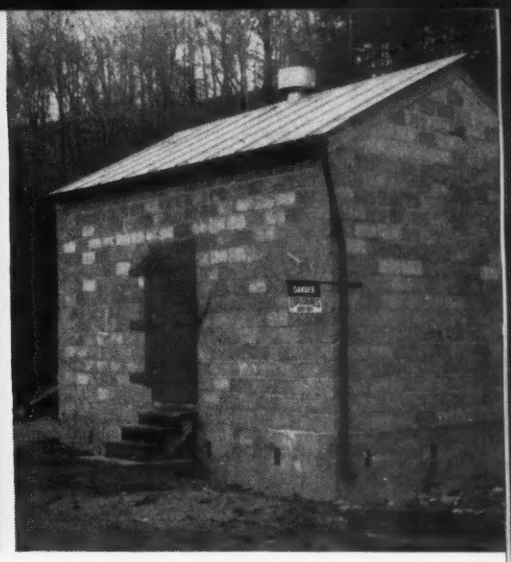
At left—the three-car rectifier station is temporarily located in the machine shop near the portal. Upon completion of the inside substation, it will be within 2,000 ft. of the load center.

Below—battery-charging stations are walled with concrete blocks and rock-dusted. Insulated platforms are provided as a safety measure.



The outside mile-long tramroad to the tipple has been relaid with 60-lb. rail, double-bonded and cross-bonded, and new trolley supports installed

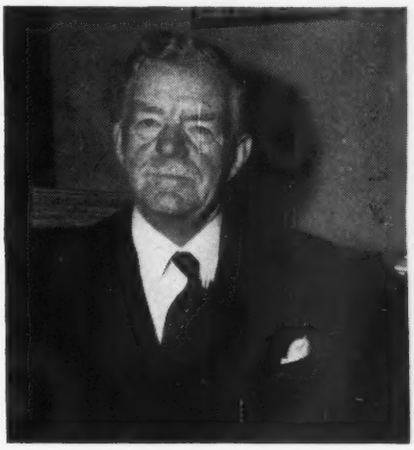




The cap and powder houses are two new additions to the surface plant.

Sixtus Campdon is president of L.C.S. Colliery, Inc.

Alfred E. Campdon is secretary-treasurer of the organization.



J. Lloyd Jones manages the office in the Porch Building, Johnstown, Pa.

Clifford Trexler (left), maintenance foreman, checks the voltage on the three phases of the 2,300-volt system. Earl Crusan, mine electrician (center), and Moss Peel, mine foreman, help keep things going underground.

136. Using concrete blocks in place of wood for stoppings and splitting the ventilating circuit have made considerable improvement in the ventilating system. A standby motor is kept at the fan as an added safety measure. Closed lamps are used and the mine is rock-dusted regularly.

New buildings near the portal include powder and cap houses and a two-story structure in which a shop, garage and heating plant are housed on the first floor, with supply storage facilities and offices on the second. The outside mile-long tramroad from the portal to the tipple has been re-laid with 60-lb. rails and new trolley supports installed.

Located at the company headquarters in Johnstown, Pa., are Sixtus Campdon, president; Alfred E. Campdon, secretary-treasurer, and J. Lloyd Jones, office manager. Officials and supervisors at the mine are Clifford Trexler, maintenance foreman; Moss Peel, mine foreman; Levi Smith, assistant foreman; Earl Crusan, mine electrician, and Walter T. Cunningham, preparation supervisor. Sales agent for L. C. S. is The Shaw Coal & Coke Co., Philadelphia, Pa.

SHARING THE FACTS:

Anthracite's Road to Better Relations

To Help Solve Productivity and Other Problems, Anthracite Shares Facts With Miners Through Supervisors and Otherwise—Industry Program, Backed up by Individual Companies, Getting Results

By W. A. STANBURY JR.
Assistant Editor, Coal Age

PROCEEDING ON THE BASIS that miner understanding and cooperation are vital ingredients and that supervisors are key factors in boosting productivity and cutting costs, anthracite, both as an industry and through individual companies, is digging into the problem of increasing efficiency, lowering costs and improving its competitive position. Sharing the facts through industry conferences, company presentations and joint labor-management groups is the basic approach. Over-night miracles are not being accomplished and overcoming long-cherished attitudes admittedly is no small task, but those who have gone furthest in the work point to improvements already registered as signs that anthracite is on the right track.

Learn Industry Facts

Since the middle of November, 1946, member companies of the Anthracite Institute have sent more than 3,000 of their supervisors and union committeemen through a one-night show staged in the Wilkes-Barre headquarters of the Institute. A typical evening followed this pattern:

5:30 p.m.—Foreman and union men began arriving, brought from their collieries in buses chartered by their company. For an hour they roved through the laboratory, where engineers and technicians answered questions about new-type stoves and furnaces under development or test and about gages, test-tubes and other research units that measure burning efficiency and help chart new uses for anthracite.

6:30—Steak with potatoes, beans, hot rolls, ice cream and cake and coffee. No speeches.

7:30 (in the assembly room)—Division chiefs began telling about the Institute's organization and its job. With charts and outlines hung on a rotating frame, they clarified the regional and national standing of the industry, competition from fuel oil, the percentage of anthracite customers in the several income brackets and the Institute's task of nailing down markets by improved utilization, better public relations, better burning equipment, statistical studies and testimony before state and federal commissions. The pace was lively, the tone informal. The presentation was to the point and, if attention is a measuring stick, effective, for listeners leaned forward on the edge of their seats most of the hour.

8:30—Laboratory reopened. A public-address system broadcast a commentator's explanation as the group moved from one working set-up to the next.

9:30—The men began boarding buses for the trip home.

Thus, anthracite is taking the first step toward building the understanding that leads to action in solving the industry's problems, chief of which is higher productivity. The Institute's sessions present the facts of anthracite's position. The question then becomes: "Does presentation of the facts lead to the logical answers?"

Spot checks indicate that sharing the facts is an effective means of stimulating the active cooperation of the supervisors and winning the support of union committeemen and officials and, finally, the miners.

"I've been a foreman for 12 years," said one supervisor as he headed for the bus after the Institute meeting, "but I never knew things like this went on. That's a good show." His comment reflected the interest written on the faces of the others—an interest that has carried over into their daily job. Union committeemen who went to Wilkes-Barre, when checked afterward, seemed most impressed with competition from gas and oil—a threat whose size had never been shown them so effectively—and with the Institute's work in developing and testing new equipment to guarantee anthracite's markets.

Work to date to put the industry's story over where it really counts—with the miner—indicates that sharing the facts is effective here, too, although the problem of changing habits and attitudes, some of very long standing, admittedly is more difficult. But results so far accomplished by the men who went through the Institute course, and thus acquired useful and effective ammunition, indicates that it can be done—and fairly quickly.

Foremen Spread the Word

Supervisors, anthracite experience has shown, want the facts and want the men in their charge to know them. "I wish our miners could see what we saw at Wilkes-Barre," said one foreman. "Can't they make a movie of it?" asked another. In addition, they want outsiders like the grocer, the doctor and the postman to know the facts, because the fortunes of these people rise and fall with anthracite. "It ought to be given before civic clubs and schools," a foreman suggested. Supervisors are active in passing the facts on to their men at their working places. Armed with notes from the Wilkes-Barre meeting, they interrupt work for five or ten minutes to show the figures and talk about the future. Occasionally they meet indifference or even hostility but they keep on hitting hard and are getting results—slowly, perhaps, but results, since facts are their own most effective persuaders.

Supervisors and companies also

appreciate that the job is a double-barreled one—in other words, that the industry programs should be supplemented by individual programs geared to the local situation and more specifically aimed at winning the cooperation of the miner in raising productivity, reducing cost, improving the industry's competitive position and bolstering the miner's income. Among the programs along these lines is that of the Philadelphia & Reading Coal & Iron Co., Pottsville, Pa., under Edward A. Lynch, director of personnel. Under way long before the Wilkes-Barre meetings began, the P. & R. program is aimed at welding all company employees—management and men—into an organization working together to advance the interests of all through better service to the consumer. It is a continuing, long-range program embracing all underground and surface workers, foremen, office employees and the community at large.

"Men of Management" is the phrase that keynotes P. & R.'s supervisory program—a plan that aims to give foremen the tools that will make them the key men in production. At irregular intervals—usually an idle day to enable second- and third-shift supervisors to attend—foremen of the company's three divisions at Mahanoy City, Pottsville and Ashland are invited to a 7 p.m. meeting in a nearby assembly hall. Attendance is voluntary.

Industry program in action—foremen and union representatives watch the Anthracite Institute's one-night show in Wilkes-Barre. Dramatic presentation keeps interest high and nails down the facts.

The Supervisor's Role

The first gathering, in the fall of 1946, was set up by top management as a mass meeting for foremen in all three divisions. The purpose and scope of the program were outlined by Mr. Lynch and a new insurance, hospitalization and surgical-care plan for company men was announced by R. E. Taggart, president. It was generally agreed among top management and foremen alike that careful planning of this first meeting shoved the program off in high gear, aroused loyalty and interest and stressed the key role of foremen in the company's future.

Since then, supervisory men themselves have planned their meetings, except for suggestions and guidance from Mr. Lynch. At the second meeting, held separately for each of the three divisions, the facts about productivity were told and graphs were displayed to show how cost savings increase as production per miner-day goes upward. At the Mahanoy City meeting photostats were given each foreman to show cost savings possible with an additional one-quarter, one-half, three-quarters and whole car per miner per day at Maple Hill, Mahanoy City and Knickerbocker collieries. Tom V. Monahan, district superintendent, asked his foremen to use these photostats in the mines to tell the story to the miners.

Mahanoy City foremen set their third meeting for Feb. 12. As the first step in a broad program to familiarize each foreman with the operations of other departments, the staff of the St. Nicholas breaker planned the evening's show.

Of a total of 220 supervisory men in the Mahanoy City district, 205 came to the local Elks' hall for the meeting. After introductory remarks, the presiding officer turned the meeting over to O. P. Swartz, breaker superintendent. With a large blueprint of the breaker hanging nearby, he talked for five minutes about the breaker's work and then, one by one, called his foremen to the platform. There he questioned each man about his job and, with pointer in hand, traced the movement of coal along the flow chart from receiving yard to finished product. In all, a round dozen of foremen talked about their jobs and their problems—yard foreman, weighman, culm-bank foreman, belt foreman, chief inspector, chief electrician, master mechanic, general foreman and others. Listeners, with a 10-page booklet they picked up as they entered the hall, learned about plant capacity, scheduling and blending, car-thawing and washing, record-keeping, the rotary car dump, refuse disposal, water supply, cleaning, sizing and the cone cleaners. Performers on the platform sparked their stories with suggestions about ways underground foremen could help them do a better job at the breaker.

At 8 p.m. Mr. Swartz halted his performance. The chairman talked briefly about the function of "monthly men" in company productivity and stability. Mr. Monahan stressed capacity operation of the breaker and asked mine foremen to keep wood chips down to a minimum, split lumps down to breaker capacity and load less rock into cars.

Shop Talk With Beer

After this, with plenty of sandwiches and a keg of beer at hand, the men circulated around the hall, asked questions of the breaker foremen, went over the breaker blueprint at close range and talked with each other until time to go home.

Best thing about the evening was its pace. No one talked long enough to become tiresome and the questions asked by Mr. Swartz kept things moving. It was easy to see that listeners were interested throughout.

P. & R. supervisors plan other meetings like this one to cover, among other things, engineering practices and safety. In addition, the productivity facts that were featured in the December meeting will be up-dated from time to time.

P. & R.'s over-all plan also goes beyond foremen to reach workers—the keys to progress. Since October, 1945, when Mr. Lynch first took over the job, communication

between top management and men has been improved by monthly pamphlets that carry the company's story directly to the miner, as well as to others in the community and elsewhere. For about two weeks before each pamphlet is distributed, 112 bulletin boards and display spots in bathhouses, colliery offices, tipples and even underground passageways announce the title of the forthcoming issue. On publication day, the pamphlets go by first-class mail to miners, supervisors, office employees and company officers at their homes. Other industries and business houses in the area, selected from telephone-directory classified sections, also are included in the mailing because the company believes, as was said in an enclosure with the first mailing, "We are bound together in these particular problems. We must win together or we lose separately."

Booklets Give the Answers

Simple and direct, these pamphlets are 600 to 800 words long. Catchy and timely titles invite attention. "Let's Talk Turkey," the November, 1945, issue, told about oil competition and falling productivity in the company's mines. The January, 1946, number, "Economic Cancer," released more figures on productivity and explained the closing down of eight jobs in three gangways as an object lesson in what happens when efficiency drops. "Do Strippings Destroy Jobs?" told in February why the company had to supplement deep mining with stripping to stay in business. In March, "Across the Kitchen Table" brought company finances down to kitchen-table terms. In June, "Don't Dig Your Own Grave" was aimed at early quits and absenteeism. "This Is for 'The Lady of the House,' Too," in November, talked about taking holidays outside the contract. For New Year, 1947, the title was "I Resolve." These pamphlets do not generalize or plead. They state the facts and nail down the answers.

Backing up its pamphlet and other work, P. & R. for over a year has been broadcasting daily to miners and other people in the communities in their region. These broadcasts re-emphasize the messages in the pamphlets, including the paramount responsibility of everybody, whether miner not, for keeping in mind the need for holding the business of the anthracite user. They also discuss competition, civic and national questions, safety and other pertinent topics. Two examples are as follows:

1. "Good evening. This is Phil Reading speaking for the Coal & Iron Co. The future of the anthracite industry is based on our ability to increase our daily production of coal. Per-man-day production in anthracite mines has been falling at an alarming rate. It must be increased if we are to continue as the main source of employment in this region. The answer lies with each individual mine worker."

2. "Good afternoon. This is Phil Reading speaking for the Coal & Iron Co. The first breaks in our commodity-price structure have begun to appear. What will happen to *our* bread and butter—anthracite coal—when the coal market breaks, as break it will? The only way our industry can hope to reduce its price is by increased per-man-day production on the part of our miners. Everyone of us living in the anthracite coal field will be vitally affected if matters should take an adverse turn. It behooves all of us to seriously consider the matter and act now."

Forum for Facts

The Locust Coal Co., Shenandoah, Pa., aims at the same goal P. & R. is shooting for—better production through miner loyalty and cooperation. This, too, is a fact-sharing plan. Since the middle of 1945, monthly miner-management meetings have given men and managers a place to air their problems in open-forum style, with the result that information has flowed freely back and forth.

Attendance at Locust Coal's men-management meetings is voluntary and open to all. Usually the general manager, J. J. Crane, presides and C. Millard Dodson, president, shares the head table with him. Always, the safety engineer, the mining engineer, the purchasing agent and inside and outside foremen are present. Section foremen and firebosses come at will. Each of the four local unions picks miners to attend. All told, about 30 men gathered for the February meeting—an average number, it was stated.

The only gag rule in these meetings is that grievances will not be discussed, since they belong to the grievance committee. Singling out each man by his first name, Mr. Crane asks if he has anything he wants to talk about. The questions that come up range all over the lot. At the February meeting, for example, a miner complained that the new bathhouse was too hot on one side and too cold on the other. After two or three others had joined the argument—the talk was straight from the shoulder and the facts came fast—the outside foreman was asked to make the needed changes. Other questions were handled in much the same way—a cold draft of air on one level, failure of some lamps, a shortage of sheet steel, slow deliveries from the warehouse, too few standby firing batteries, trouble in starting the air compressor and a proposal to merge drives for the Red Cross and other welfare agencies. A clerk took notes on all complaints and comments to help the general manager follow up.

With these questions out of the way, the safety engineer reviewed the month's accidents, compared these with earlier figures, traced some loose detonators back to the crews they were issued to, announced plans for the next monthly safety meeting and asked for help in forming additional first-aid teams. The purchasing agent talked about wasted supplies, and Mr. Crane, backing him up, added figures on monthly supply costs. To drive home his argument that full employment is impossible without high productivity, Mr. Crane showed charts on payroll, efficiency and total production. Figures on costs and profits were not released at the February meeting but they had been passed along to the men at earlier meetings. After a few comments from President Dodson on the market outlook and working time, the meeting ended and men and managers drifted out.

Boosting Safety

Locust Coal's monthly safety meeting also is a part of its employee relations setup. A typical safety program starts off with a news reel, followed by a safety film from such organizations as the U. S. Bureau of Mines, the Bethlehem Steel Co. or the Golden Gate bridge builders. For each meeting a speaker is featured—a federal mine inspector, a mining engineer, a doctor, a ventilation expert or an official of the U. M. W.

Believing that mine safety is a family matter, the company makes these meetings attractive to wives as well as miners. An attendance of about 100 wives in a total audience of 500 in February is good evidence of family interest. Drawings for door prizes, cash and suits of clothes add zest to the meetings. Eligibility for prizes is established for workers in each mine who hold

their accident rate below a bogey, or norm, based on the 1944 record. Current interest centers on a safety slogan contest. More than half the entries thus far have come from wives or children of miners.

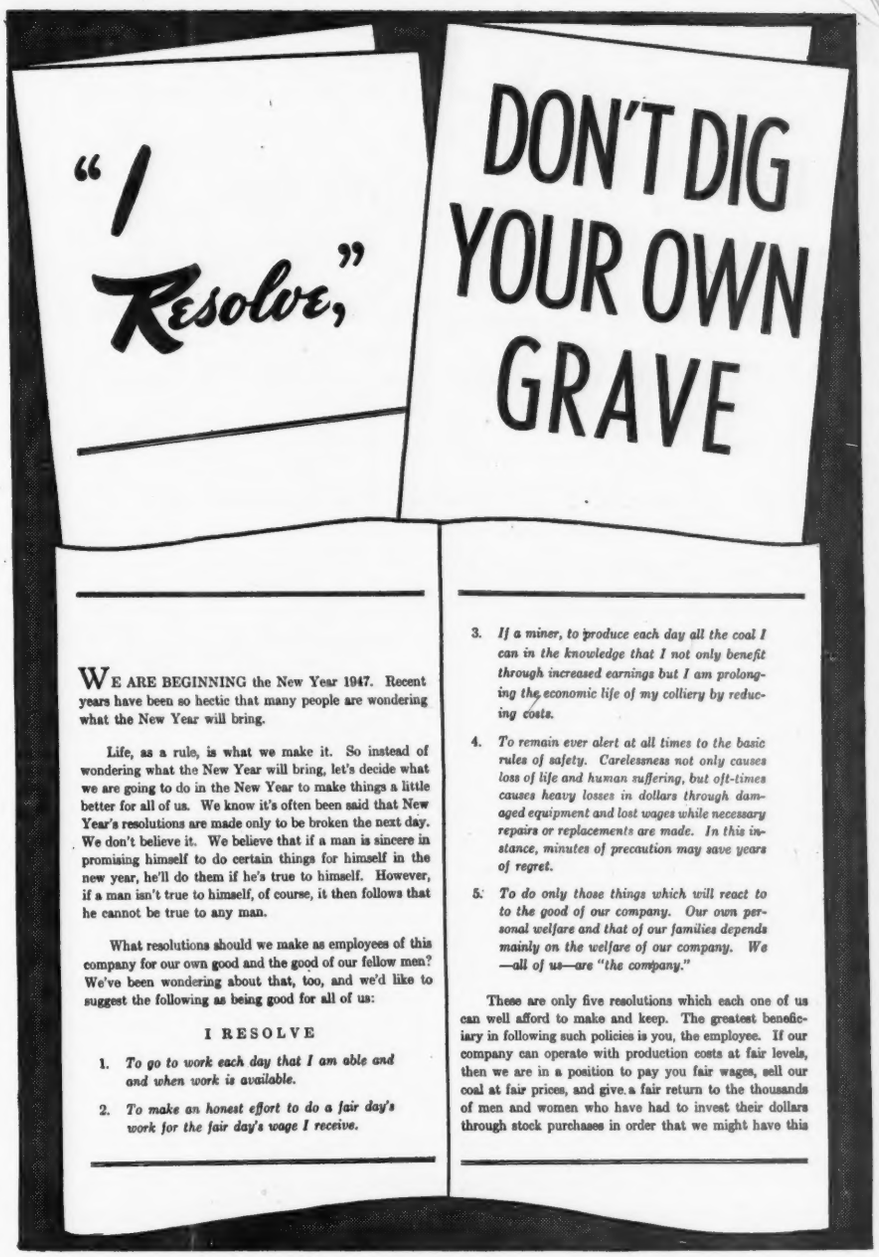
In addition to such personal contacts in men-management and safety meetings, the Locust Coal Co. circulates a monthly printed news sheet with pictures about company activities, safety, competition, working time, weather, equipment and supplies. The paper, called "Our Bread and Butter," goes by first-class mail to every employee.

Programs like these at P. & R. and Locust are costly investments. Are they paying off? There is no easy answer to this question. Factors other than boosted morale and loyalty can send productivity up—better engineering, selective mining, new machines, etc.—and there are no accurate measuring sticks for the imponderables of human relations. But officials at P. & R. and Locust Coal were aware of these facts from the beginning and they went ahead with faith that results would show up.

Weighing the Results

The facts that are emerging are encouraging. In 1940 and 1941, productivity began to fall at P. & R.'s operations and costs moved upward during the war years. Readjustments in mining practices seemed to have little effect. In 1946, however, after the early pamphlets had had time to soak in and as new ones kept coming, the decline was arrested and finally the trend turned upward again. Since then, production per miner-day, production per man-day and tons of recoverable coal per 100-ton car have increased and labor costs per ton would be less were it not for the advances which were made in the wage scale in the interim.

Since the return of P. & R. supervisors and committeemen from the Institute's Wilkes-Barre meeting, relations with grievance committees have improved. Meetings are now less stormy, and grievances have dropped off in number. A P. & R. foreman, who claimed to have the toughest mine committee in the region, could not say what had caused it—the company's pamphlets, the Wilkes-Barre show or the object lesson of a few nearby closings—but he was sure his committee was easier to get along with. "You've got to live with them, work with them and fight with them," he said, "but it's not as hard now as it used to be."


"I Resolve,"
DON'T DIG YOUR OWN GRAVE
WE ARE BEGINNING the New Year 1947. Recent years have been so hectic that many people are wondering what the New Year will bring.
Life, as a rule, is what we make it. So instead of wondering what the New Year will bring, let's decide what we are going to do in the New Year to make things a little better for all of us. We know it's often been said that New Year's resolutions are made only to be broken the next day. We don't believe it. We believe that if a man is sincere in promising himself to do certain things for himself in the new year, he'll do them if he's true to himself. However, if a man isn't true to himself, of course, it then follows that he cannot be true to any man.
What resolutions should we make as employees of this company for our own good and the good of our fellow men? We've been wondering about that, too, and we'd like to suggest the following as being good for all of us:
I RESOLVE
1. To go to work each day that I am able and and when work is available.
2. To make an honest effort to do a fair day's work for the fair day's wage I receive.
3. If a miner, to produce each day all the coal I can in the knowledge that I not only benefit through increased earnings but I am prolonging the economic life of my colliery by reducing costs.
4. To remain ever alert at all times to the basic rules of safety. Carelessness not only causes loss of life and human suffering, but oft-times causes heavy losses in dollars through damaged equipment and lost wages while necessary repairs or replacements are made. In this instance, minutes of precaution may save years of regret.
5. To do only those things which will react to to the good of our company. Our own personal welfare and that of our families depends mainly on the welfare of our company. We —all of us—are "the company."
These are only five resolutions which each one of us can well afford to make and keep. The greatest beneficiary in following such policies is you, the employee. If our company can operate with production costs at fair levels, then we are in a position to pay you fair wages, sell our coal at fair prices, and give a fair return to the thousands of men and women who have had to invest their dollars through stock purchases in order that we might have this

Straight-from-the-shoulder talk keeps miners informed and builds spirit of cooperation. Each month, employees of the Philadelphia & Reading Coal & Iron Co. get the facts from pamphlets like these.

Locust Coal Co. officials, too, believe that straight-from-the-shoulder dealings on both sides are showing good results. They point to a boost of about 30 per cent in productivity since a low point in 1945, fewer grievances, better relations with mine committees, and symptoms of growing loyalty to the company and faith in its management. "Our faces have been red a good many times in men-management meetings," a Locust Coal official said, but he believes that the open discussions have uncovered many situations that might have developed into grievances otherwise. Top men at Locust are careful to say that the real test of the program will come if hard times set in, but the record thus far assures them that they are taking a long step in preparing for the future.

Thus, with programs like these at work and with results already marked up, the Anthracite Institute and forward-looking companies have found that sharing the facts through foremen education and straight talk to miners wins loyalty and cooperation and pays dividends that other measures—a high wage scale, an incentive wage, better engineering, more machines and even getting tough have failed to pay.

Returns on this investment in human relations are more tons per man-day, more tons of recoverable coal per car, fewer labor disputes and stoppages, steadier working time and more profits for owners, managers and miners.

GROUND FAULTS:
New Protection for 2,300-Volt Cables

Overload Circuit Breakers Not the Answer — Ground-Fault Protection Therefore Necessary—VRC and DGC Systems Compared — VRC Protection Improved by Installing New Tripping Equipment

By LEONARD WILSON
Consulting Engineer, Independent Coal & Coke Co., Salt Lake City, Utah

THE PRIME OBJECTIVE of electrical protection in coal mines is elimination of the possibility of the occurrence of a visible spark and, by so doing, to eliminate completely the hazards of fire and explosion. That objective cannot be attained by overload circuit breakers; hence, the necessity for appropriate ground-fault protection.

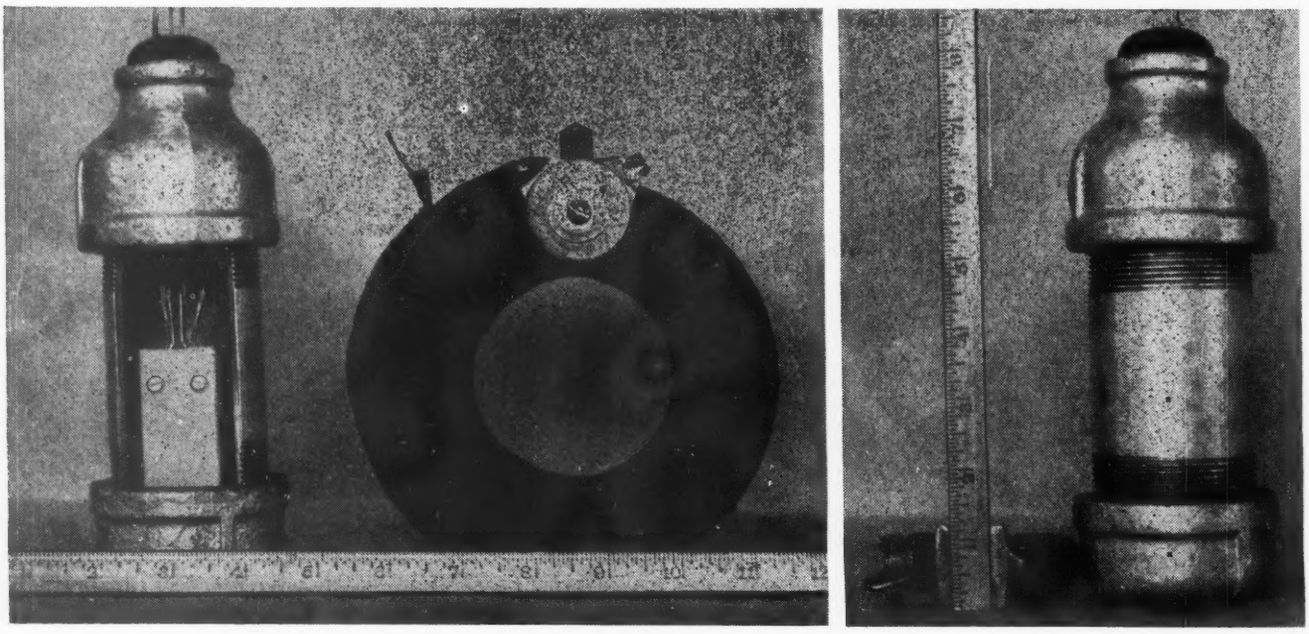
Ground-fault protection necessitates the establishment of a suitable permanent ground on the system. Practical considerations dictate that the established ground be the neutral point of the system. In the great majority of coal mines the 2,300-volt circuits are fed from delta-connected 2,300-volt transformers without a neutral point.

Operation with a 2,300-volt ungrounded system inherently results in extremely hazardous conditions. In such a system the voltage of the neutral point normally remains at ground potential, solely because of the equal capacitance to ground of the three phases. If a dead ground suddenly occurs on one phase, the voltage to ground of each of the other phases suddenly rises from 1,330 to 2,300 volts, producing no noticeable effect except upon the ground detector.

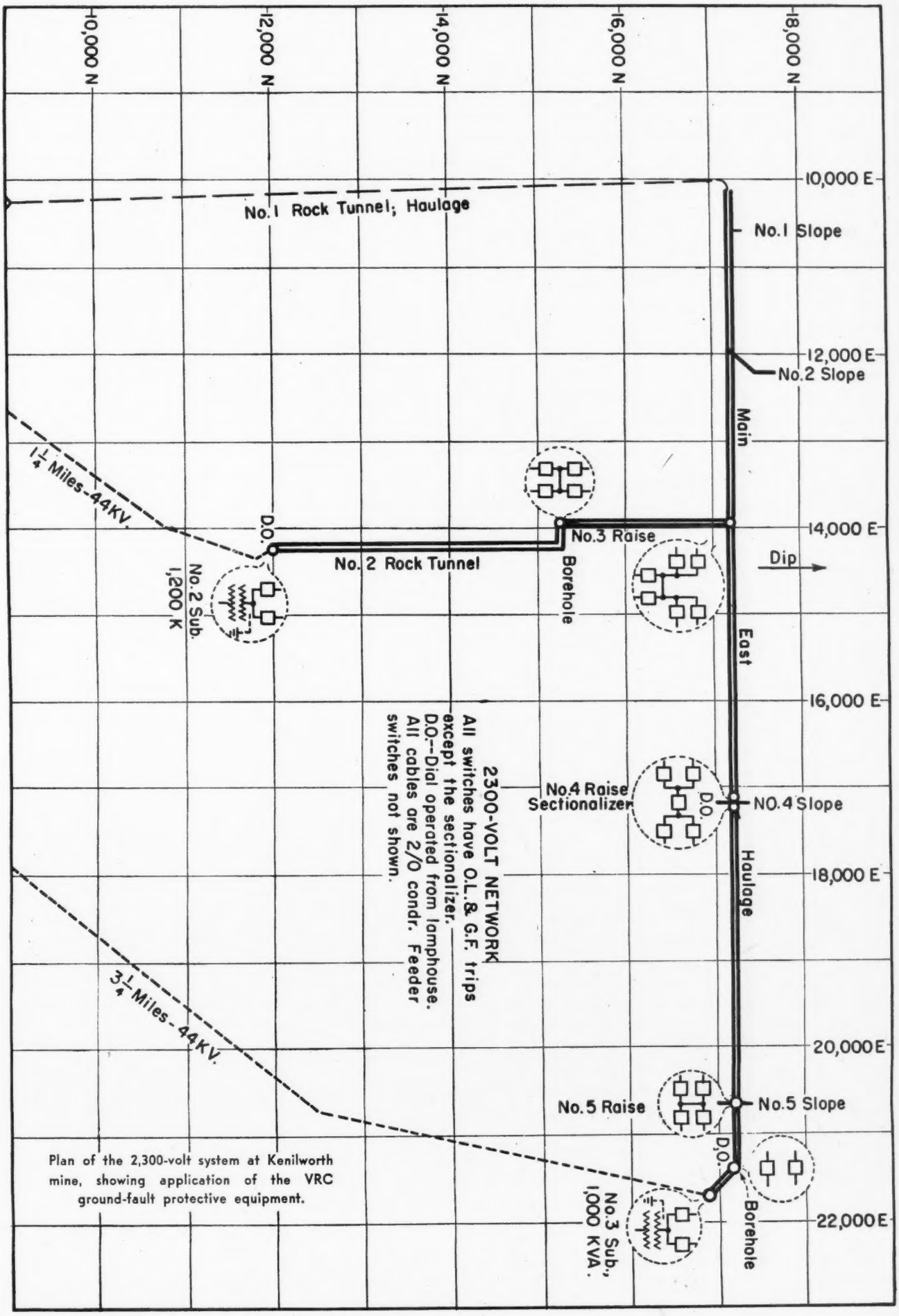
If, however, an initial ground fault on one phase starts at a high resistance, as is usually the case, the results may be disastrous. A pin hole through the insulation may result in a small spark discharged to ground that may—and frequently does—set up a dangerous high-frequency high-voltage oscillatory condition that may—and frequently does—puncture insulation at some other part of the system even though the insulation at the puncture could have withstood a test of 6,000 volts. This is not an unusual phenomenon and I have personally witnessed or investigated many such cases that had resulted in death or destruction of property. The lesson is that ungrounded 2,300-volt circuits must not be permitted.

The Crucial Question

The question of how to obtain a derived neutral and ground it is crucial. The requisite condition is that the bank of grounding transformers have adequate capacity to furnish current through a ground fault sufficient to actuate the ground-fault tripping device. If



New units for improving the VRC ground-fault tripping method. In the center is the circular-core current transformer with two-cell copper-oxide rectifier; left is the relay pipe case designed for oil immersion. The right-hand view shows the exterior of the pipe-and-nipple case for the relay.



Plan of the 2,300-volt system at Kenilworth mine, showing application of the VRC ground-fault protective equipment.

three single-phase transformers are used with 2,300-volt primaries connected star, with grounded neutral and secondaries closed delta, then a 75-kva. bank can provide 15 amp. of ground-fault current. If 150 amp. of ground-fault current has to be provided for, the bank must have a capacity of 750 kva. The smaller the current required to actuate the tripping devices, the less the cost of ground-fault protection—and, incidentally, the greater the effectiveness.

The various new methods of ground-fault tripping developed at Kenilworth mine of the Independent Coal & Coke Co., Kenilworth, Utah, are based on tripping at 5 amp. With the ground-fault current limited to 15 amp. and the power cut off instantaneously, there is little chance of a visible spark occurring in case of a failure in a cable during operation.

There are two distinct methods of energizing a ground-fault tripping relay on a three-phase system. The first is applicable to any type of circuit and depends upon measuring the vector resultant of the current in three phases. This is always zero when there is no ground-fault current and is equal to the ground current when ground fault occurs. This method is referred to as the VRC ("vector-resultant-current") method. The second method depends on measuring the actual ground-fault current on its way from fault to ground. It is referred to as the DGC ("direct-ground-current") method. This method is applicable only to types of circuits that have ground shields connected to ground through the tripping coil. It also is applicable to d.c. circuits.

VRC Tripping Method

The old method used three current transformers with the secondaries connected star through the relay. The new method uses a circular-core current transformer with the three-phase cable passing through the center, with a small secondary winding for operation of a very sensitive relay.

The core is made of circular punchings with three dimensions: 3 in. I.D., 6 in. O.D., 1 in. thick. The iron has a very high permeability. The secondary winding has 80 turns of No. 20 Formex wire with a center tap. A small two-cell copper-oxide rectifier is incorporated with the transformer to give full-wave rectified current for a sensitive d.c. relay. The relay is a Western Electric G-1 unit mounted vertically in a 2-in. pipe nipple filled with oil. The sensitivity is 20 milliamp., 37.5 ohms, 0.75 volts, 15 milliwatts.

The momentary capacity of the coil immersed in oil is much above requirements. The capacity of the contracts immersed in oil is ample for tripping any type of oil circuit breaker. The combination will trip with 5 amp. of vector-resultant current in the three-phase cable passing through the core: that is, with five ampere-turns primary at 60 cycles.

Quick Tripping the Goal

The primary objective of this new method of ground-fault protection is to trip open the circuit the instant a ground fault starts to delevop by relays that go into action when the ground-fault current is only 5 or 10 amp. A ground-fault current of 10 amp. occurs when the insulation resistance to ground is 133 ohms. If the insulation resistance to ground drops to a much lower value, the amount of ground-fault current becomes limited by the capacity of the banks of grounding transformers. This is of the greatest importance because it insures that during the fraction of a second required to trip out the circuit the current through the fault does not attain a magnitude that would produce a damaging effect and that the small spark will be confined to the inside of the cable, motor winding, transformer or oil switch where the fault occurred.

The second objective is localization of the ground fault and its isolation with the least disturbance to system operation. This entails individual ground-fault protection of each unit section of the 2,300-volt system, with a proper degree of selective tripping of the ground-fault relays. How this is accomplished depends upon the layout of the 2,300-volt system.

Cables in Multiple

At Kenilworth mine, 2,300-volt power for underground use is supplied by two 44-kv. step-down substations with a total capacity of 2,200 kva. These are connected to the two ends of an underground cable-bus tie line comprising 3,-500-ft. runs of 2/0-conductor cables, two in multiple. Total tie-line length is 14,000 ft. At the 3,500-ft. spaced junctions where the cables are multiplied, each of the four cables connects to the junction bus through an oil-circuit breaker. Feeder cables to points of power use are tapped to these junction-bus points—each through an oil circuit breaker. With this layout the unit sections, each with individual ground-fault protection, consist of each of the runs of cable in the multiple-bus tie line, plus each of the outgoing feeders. There is also individual ground-fault protection for each m.g. set, rectifier, hoist, etc. For derived neutral grounding there is a bank of transformers with a capacity of 75 kva. at each of the two transformer substations at the ends of the tie line.

The means for securing selective tripping when a ground fault occurs are practically inherent in the layout of the system. The ground-fault current for any fault to ground is furnished jointly from the two banks of grounding transformers, 50 percent from each. From each bank it splits to the two cables in multiple of the tie line. Therefore, each cable of the tie line carries 25 percent of the ground-fault current.

DGC Tripping Method

This method is particularly applicable to the ground-fault protection of a run of cable with internal ground wires. The only connection from the internal ground wires is to the trip coils and thence to ground. A small isolating transformer should be used. Any incipient failure of the insulation will charge the ground wires, trip out both ends and isolate the cable. There will be no external visible spark. The definite advantage of DGC over VRC tripping is in the protection of a single run of tie-line cable and lies solely in the fact that the DGC trip for such a cable run is entirely unaffected by any ground fault other than the one in that cable.

The methods of ground-fault protection described in this article are, in reality, methods of protecting the mine from any ill-effects resulting from the occurrence of a ground fault. It is of far greater importance to prevent the occurrence of ground faults wherever possible. This results from improved insulation standards. At Kenilwork mine 2,300-volt cables are specified to have 5,000-volt insulation, oil switches are designed for 5,000 volts and bus bars are insulated for 11,000 volts.

1950-1960

he Twentieth Century Fund, a privately-endowed esearch foundation, has just completed a monu- ental 875-page work called "America's Needs and esources." In it is presented a detailed preview of hat economic life in the U. S. A. during the 1950-60 ecade will be like if we succeed in maintaining high- vel employment. From the findings of the Twentieth entury Fund survey, the McGraw-Hill Department Economics has prepared this synopsis, which high- hts points of interest to readers of this magazine.

POPULATION

A nation's wealth depends more than anything else on the size and vigor of its population. Much of the increase in U. S. production during the past hundred years is a result of a rapid growth in population. This growth supplied manpower for farms and factories and provided an expanding market for consumer goods and services.

MORE PEOPLE WORKING . . .

Growth was the outstanding fact about population before 1930. The birth rate was almost double the death rate and there was a heavy flow of immigrants. Between 1900 and 1930, the population increase averaged 15 million each decade. Immigration contributed a third of the increase.

But this trend was checked by the depression 30's which stemmed the flood of immigrants and cut the birth rate by forcing postponement of many marriages. As a result, fewer than 9 million persons were added to the population between 1930 and 1940. This was an important factor in prolonging the depression because it slowed the growth of consumer markets.

WARTIME MARRIAGE BOOM

War and postwar conditions have brought a boom in marriages. They have exceeded normal by more than 1,500,000 since 1940. There will be more newly-married couples in 1950 than ever before and the birth rate may be roughly 10% higher than in the early 1930's. So the 20th Century Fund looks for an increase of 12 million in total population between 1940 and 1950 and a further increase of 10 million in the 1950's.

This will mean a faster-growing market for homes, autos, food, clothing, and other consumer items than we had in the 1930's. It will mean crowded schools and more people seeking jobs.

There are four major population trends which will affect markets in the 1950's:

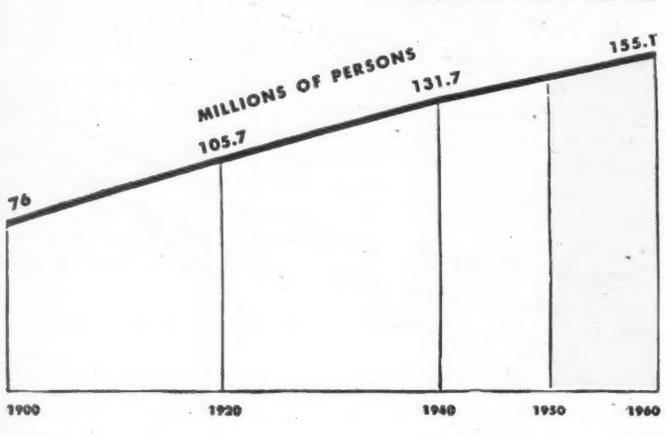
1. The number of families will continue to increase more rapidly than the number of people as families grow smaller. This is significant because the market for housing, appliances, and many other things depends more on the number of families than on the number of people.

2. Our population will be getting older. But it will not be getting less productive because the proportion of the population between the ages of 20 and 60 will be higher than in past decades. Still, the most striking increase will take place in the number of people over 60—from 14 million in 1940 to more than 20 million in 1960. This will bring greater demand for medical services and social security. An important cause of this trend is our success in controlling communicable disease. The following table shows how the death rate from selected causes has changed since 1900.

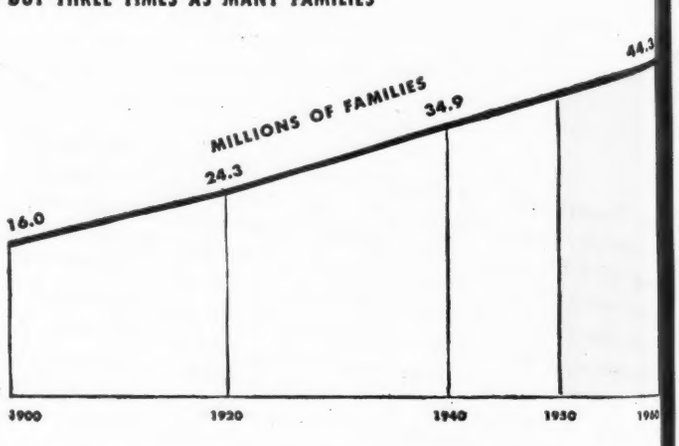
Death Rate Per 100,000 Persons

	1942	*1900*
Diseases of heart	295	137
Cancer and other malignant tumors	122	64
Influenza	56	202
Tuberculosis	43	194
Diarrhea and enteritis	9	143
Whooping cough	2	12
Diphtheria	1	40
Measles	1	13
Typhoid and paratyphoid fever	0.5	31
Scarlet fever	0.3	10
Other	505.2	873
	1035.0	1719

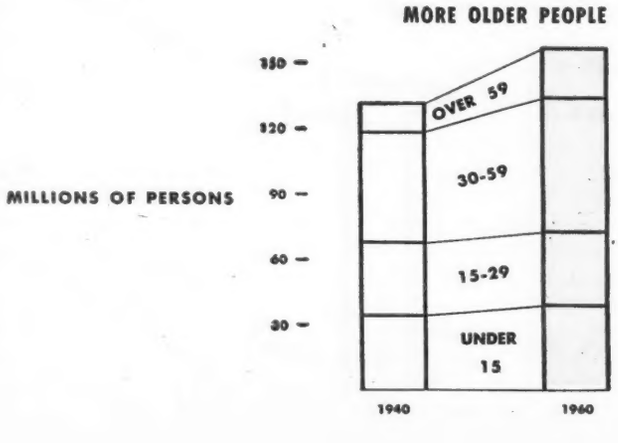
TWICE AS MANY PEOPLE



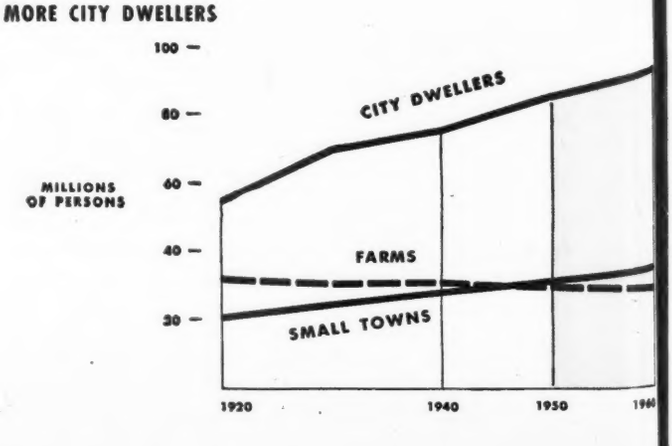
BUT THREE TIMES AS MANY FAMILIES



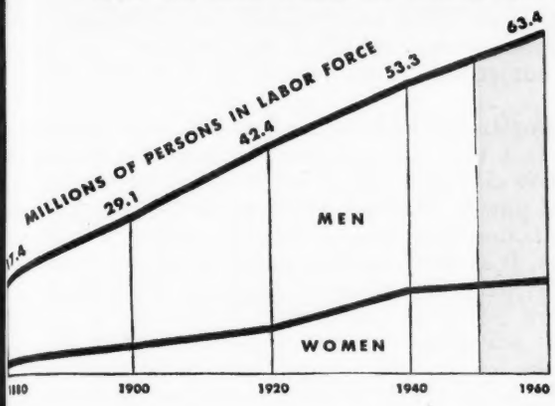
MORE OLDER PEOPLE



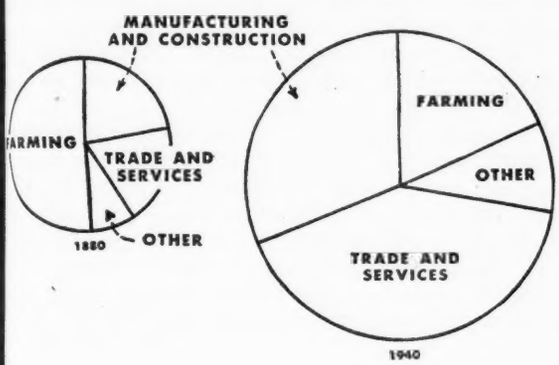
MORE CITY DWELLERS



MORE AND MORE WOMEN ARE SEEKING JOBS

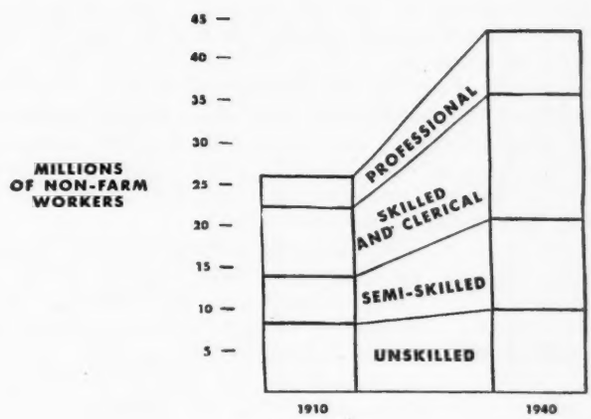


FARMING IS GIVING WAY TO OTHER OCCUPATIONS



ANATOMY OF THE LABOR FORCE

THE LABOR FORCE IS GROWING MORE SKILLED



3. The population will continue to become more urbanized. Small and medium-sized cities will grow faster than the largest cities. The general westward migration which was accelerated by the war will continue.

4. Our people will keep on getting more homogeneous. There has been almost no immigration since 1929, so the number of immigrants who have been in the country for less than 20 years will make up less than one percent of the population in 1950 as against 10% in 1930.

An even more important factor in making the population all of a kind has been the growth of universal education. The proportion of children 14-17 years old attending high school doubled between 1920 and 1936. The rise of the radio, movies, and national magazines has also levelled us out. These developments not only raise the general educational level of the nation but also tend to standardize the public's tastes and attitudes.

LABOR FORCE

The volume of goods and services produced by 145 million persons in 1950 and 155 million in 1960 will depend on what share of the population is in the labor market and the amount of work those employed actually do. The proportion of the population in the labor force has shown little change in the past few decades. So the 20th Century Fund assumes that the relationship between labor force and population will be about the same in 1950 and 1960 as it was just before the war. On this basis 60 million people will be in the labor market in 1950 and 63.4 million ten years later.

As you can see from the charts, however, there will be several important changes in the composition of the labor force. More women will be working. In 1870 only one out of every eight worked. By 1940 the proportion had grown to one out of four, and evidently will go on rising.

However, the increase in the number of women working will just about be offset by earlier retirements and longer schooling. This explains why there is little change in the ratio of labor force to population.

UNEMPLOYMENT

The effectiveness of the labor force depends not only on its size but on how fully it is employed. We have never had full employment in the sense that everyone able and willing to work had a job at the same time. Even in good years unemployment has seldom averaged less than 5% of the working force because workers are always moving from job to job. And in 1932, nearly one-fourth of all workers were unable to find jobs.

For this reason, the 20th Century Fund assumes that, even with good business in the 1950s, unemployment will average 5% of the labor force. This works out to 3 million unemployed in 1950.

In addition, the Fund expects the long down-trend in average weekly hours to continue. A century ago, workers put in a 12 hour day for 6 days a week. By 1940 the average work-week had declined to 44 hours in non-agricultural jobs and 52 hours in agriculture. If this trend continues, the average in non-farm jobs will be down to 38 hours a week in 1960, and farmers will work 48 hours.

Adding all this up, and allowing for vacations, absenteeism, and sickness, the 20th Century Fund estimates that the U. S. will put in 121 billion man-hours of work in 1950 and 118 billion in 1960. This compares with 105 billion in 1940 and with 154 billion at the peak of the war effort. The quantity of goods and services that can be turned out with this amount of labor effort will depend on average output per man-hour, or productivity.

PRODUCTIVITY

The key to our future economic welfare is productivity. It is the five-fold increase in output per man-hour that has made it possible for us to work shorter hours and still enjoy a rising standard of living. This increase in productivity has been accomplished not by working harder but by constantly inventing better machinery to supplement human energy with mechanical power.

Of course, in any specific factory at any given time, productivity depends largely on the willingness and ability of labor and management. But over the years, the actual effort of the individual worker becomes much less important than the effort of the machine. The most energetic and skilled blacksmith of a century ago could not remotely approach the productivity of today's semi-skilled worker operating automatic power-driven equipment.

ACH PRODUCING

IORE . . .

In 1860, the average worker turned out 33¢ (in 1944 dollars) worth of goods in an hour. By 1940, this had grown to $1.22. This sensational increase in productivity was due to the increased use of power-driven machines. In 1860, the average worker had the help of only half a horsepower of animal or mineral energy. In 1940, he had the use of 2.7 horsepower. To put it another way, if there had been no increase in the use of mechanical power since 1850, it would have taken 290 million workers to turn out the amount of goods and services actually produced at the peak of the war effort by only 63 million workers.

DO MACHINES KILL JOBS

Past history also shows that we need not fear the long run effects of the introduction of labor-saving machines. On the contrary, the only way we can improve the material welfare of everyone is to continue and even step up the rate at which we save labor by using machines.

Some people, it is true, are thrown out of work and a few of them may not be able to find other jobs easily. But mechanization more than compensates for "technological unemployment" by making it possible to produce more and better things for everyone—things that themselves create jobs. Development of the railroads and the automobile, for example, put a lot of canal boat and livery stable operators out of business. But it cut the cost of transportation and created many times more jobs than it eliminated.

The 20th Century Fund also points out that the most important reason that the technological revolution developed luxuriantly in the U. S. between 1850 and 1940 was that competitive enterprise provided a generally favorable climate. It is true that natural resources were plentiful and that the population was growing rapidly both in numbers and in skill. But what we had to a unique degree here was an atmosphere which favored risk-taking, fostered the vast capital investment necessary to harness and apply mechanical energy, and provided the incentives necessary to put capital and inventiveness to work.

No other economy has equalled ours in the ability to produce more and more with continually diminishing human effort. The test it now faces is whether it can eliminate the ups and downs in production and employment that have gone along with it. But an abundance of evidence indicates that we ran into trouble after 1929 not because we developed too many labor-saving machines but because we didn't adjust our economic mechanism to keep the process going.

The key importance of mechanization is indicated by the fact that the increase in national production since 1860 closely parallels the increase in use of mechanical power. Between 1860 and 1940, both volume of production and use of energy multiplied about 11 times. It is clear that, in order to keep our standard of living rising, we must continue to apply more and more power to production.

Chief advantage of mechanical energy is, of course, its low cost. Electric energy is now delivered for as little as a cent a horsepower, while the same amount of human energy costs $10.

And there are other important advantages. Mechanical energy can be delivered in greater concentrations than any other form. It is also more convenient, compact, mobile, and controllable. Consolidated Edison in New York delivers enough electricity in a day to do the work of 3 million draft horses.

These advantages are now so universally accepted that it's hard to realize how recently we left the horse and buggy era. At the turn of the century, animals and men provided more than half the energy used in production and transportation. It wasn't until World War I that trucks replaced horses in local hauling and tractors began to invade the farms. Here is how the use of mechanical energy has grown since 1850:

	Total Energy Output (Billions of Horsepower-Hours)	Percent Supplied by:		
		Mechanical Energy	Humans	Animals
1850	17.6	6	15	79
1860	25.2	7	14	79
1870	27.8	12	15	73
1880	39.9	17	14	69
1890	61.1	28	12	60
1900	82.9	38	10	52
1910	131.4	57	8	35
1920	197.4	73	6	21
1930	238.3	84	5	11
1940	289.4	90	4	6
1950	410.4	94	3	3
1960	489.8	96	2	2

PRODUCTIVITY IN THE FUTURE

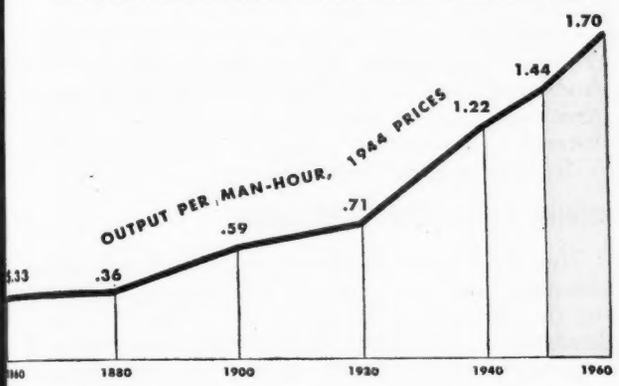
Any attempt to predict future developments in productivity is complicated by the fact that the changes do not occur at an even rate. Between 1850 and 1940 the average increase in output per man-hour was 18% per decade. But the changes varied all the way from 3% between 1870 and 1880 to 42% for the decade ending in 1940. There is, therefore, no simple way to extend past trends to obtain a foolproof figure for productivity at a future date.

For purposes of this study, however, the 20th Century Fund assumes that the average rate of increase since 1850 may be projected to estimate output per man-hour in 1950 and 1960. Thus, output per man-hour works out to $1.44 in 1950 and $1.70 in 1960 as against $1.22 in 1940 (all in 1944 dollars).

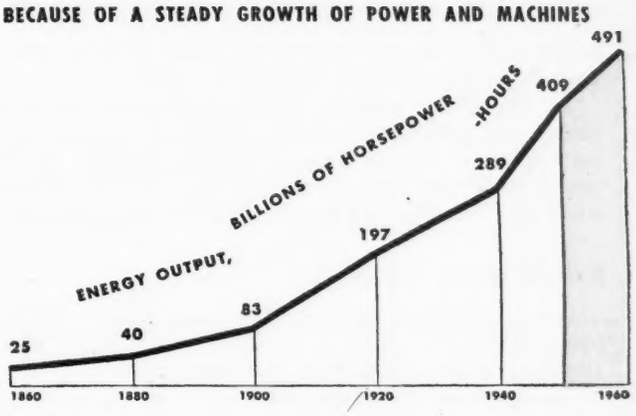
As the Fund points out, this is a critical assumption, and it is further complicated by the fact that there is a wider possibility of error in this estimate than in most of the others in the study. If, for example, it is assumed that productivity will increase at the pace set from 1920 to 1940 which averaged 36% per decade, then 1960 production would be about double the 1940 level instead of only 157% of it, as the 20th Century Fund estimates.

A CENTURY OF ECONOMIC PROGRESS 1860–1960

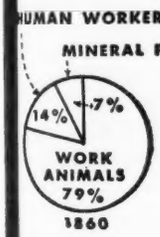
OUTPUT PER MAN-HOUR SHOULD BE 5 TIMES AS GREAT

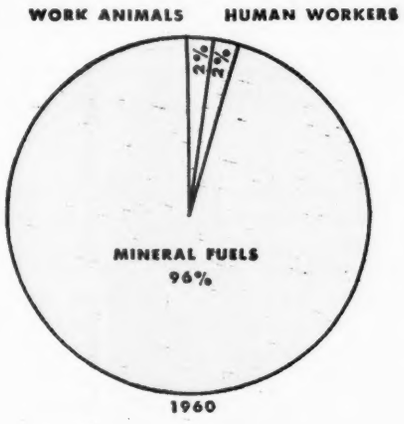


BECAUSE OF A STEADY GROWTH OF POWER AND MACHINES

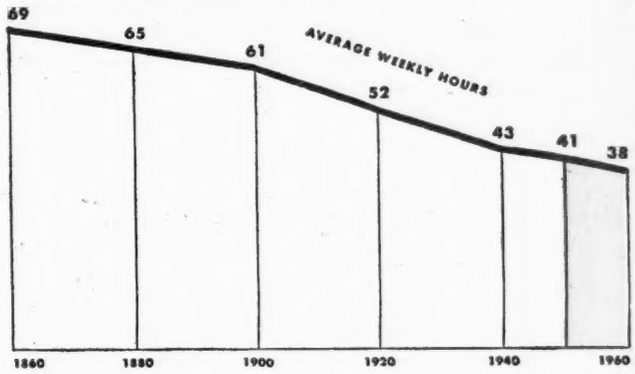


SO WITH LESS EFFORT

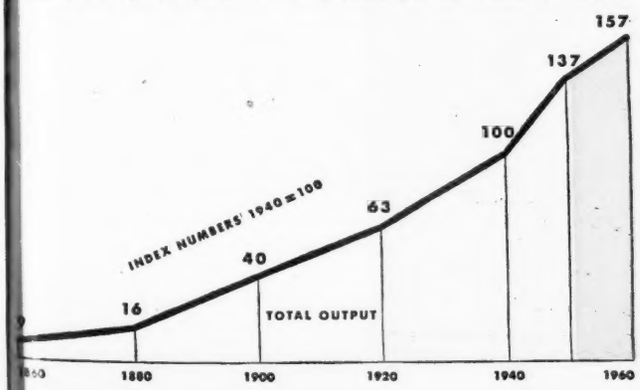




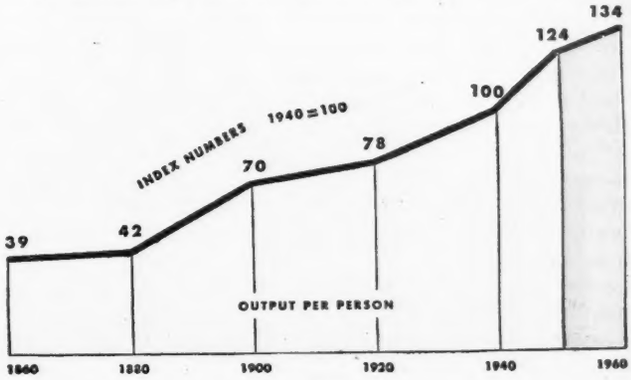
AND A SHORTER WORK WEEK



TIMES AS MANY WORKERS CAN PRODUCE 17 TIMES AS MUCH



AND PROVIDE 3½ TIMES AS MUCH OUTPUT FOR EACH PERSON



TOTAL NATIONAL OUTPUT

The potential volume of goods and services in 1950 and 1960 can be determined by simple arithmetic, using the assumptions outlined on the preceding pages. Of an estimated population of 145 million in 1950, about 60 million persons will be in the labor market and 57 million of them will have jobs if we succeed in keeping business activity at a high level.

This many people would work 121 billion man-hours. With output per man-hour estimated at $1.44 (in 1944 dollars) the total value of goods and services produced, or the gross national product, would come to $177 billion. Similar calculations yield a gross national product of $202 billion for 1960.

As the 20th Century Fund emphasizes, these estimates are neither a forecast of actual production nor an appraisal of maximum potential production. They are merely an attempt to show in dollars and cents what can be achieved with high-level employment.

HIGHER LIVING STANDARDS

Compared with any prewar year, a gross national product of $177 billion in 1950 and $202 billion in 1960 would represent a handsome gain. It would make possible a substantial rise in living standards. In 1950 we would produce a fifth more than in 1941.

CAN TURN OUT ENOUGH GOODS AND SERVICES . . .

However, the volume of goods and services turned out in 1950 would be only slightly higher than present production. This is because the number of persons at work today is 2 million above the estimated normal for 1950, and average weekly hours are higher than they will be then. Almost a million and a half of the emergency workers dra into the labor force during the war are still at wo and unemployment is lower than the figure assum for 1950.

The estimates of 1950 and 1960 gross national pr uct, as well as the figures for past years used in t chart, are expressed in 1944 prices. This is not a p diction that the price level will settle down to the 19 level which would involve a drop of 18% in the c of living and 26% in wholesale prices. It is merely device to eliminate price fluctuations so that the f ures will show only the actual changes in the physi volume of production.

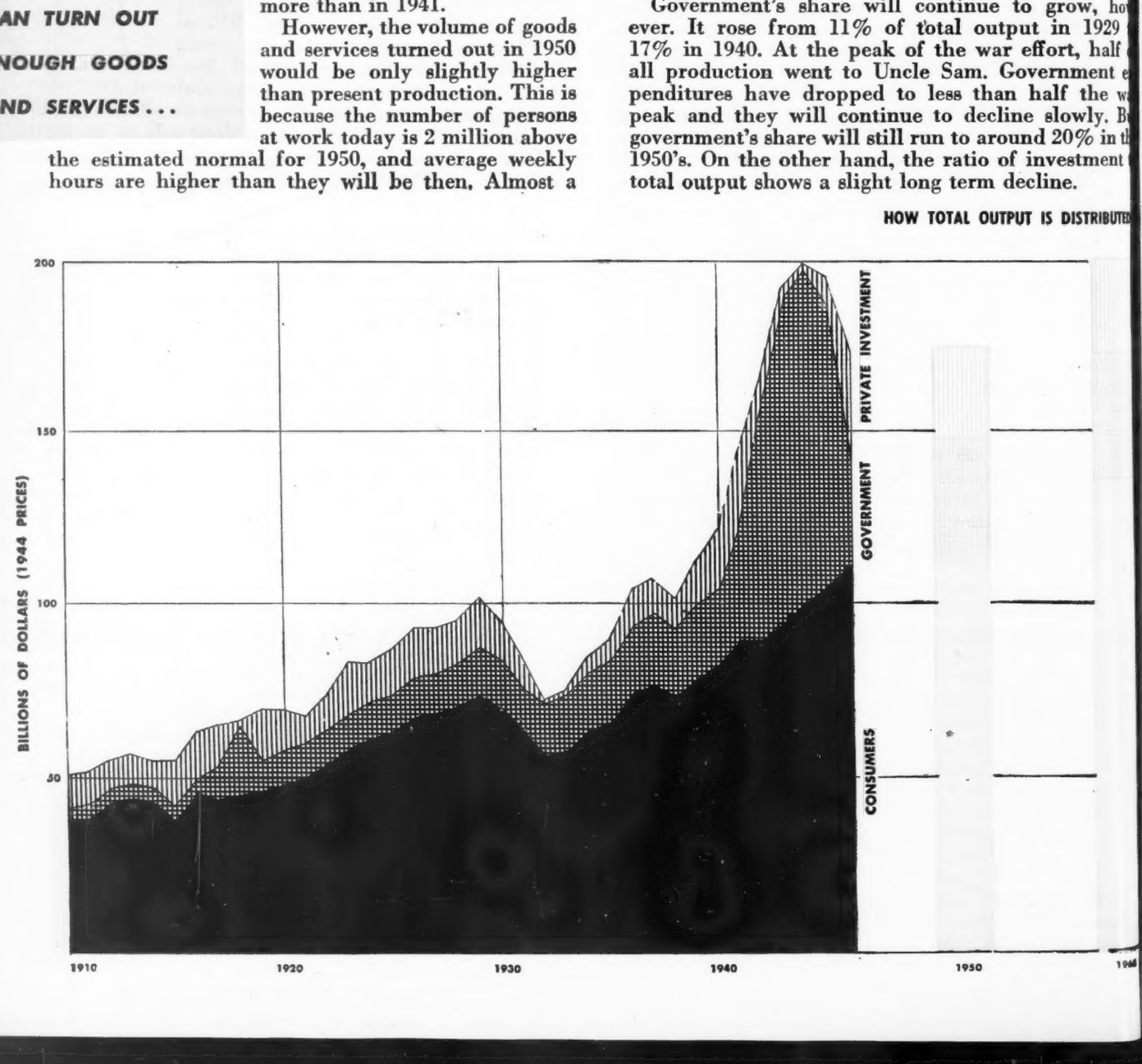
Gross national product measures the total mark value of everything the nation produces. All t goods and services produced are absorbed in one three ways: by consumer expenditures; by expen itures for investment in capital goods or inventori or by government expenditures.

HIGHER TAXES, LESS INVESTMENT

The division of total output among consumers, i vestment, and government will be somewhat diff ent in 1950 and 1960 than in the past. About tw thirds of total output will go into consumer goo and services. This is about the same as the propo tion in prewar years.

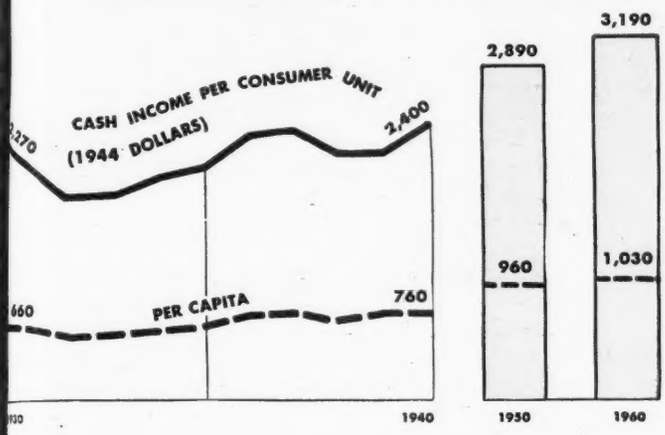
Government's share will continue to grow, ho ever. It rose from 11% of total output in 1929 17% in 1940. At the peak of the war effort, half all production went to Uncle Sam. Government e penditures have dropped to less than half the w peak and they will continue to decline slowly. B government's share will still run to around 20% in t 1950's. On the other hand, the ratio of investment total output shows a slight long term decline.

HOW TOTAL OUTPUT IS DISTRIBUTE

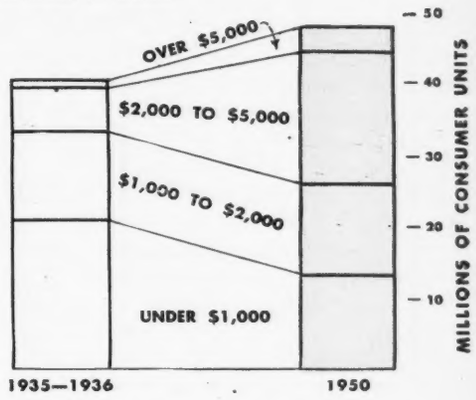


MORE CONSUMER PURCHASING POWER

CONSUMERS WILL BE ABLE TO BUY 50% MORE THAN IN 1930'S



EVERY OTHER FAMILY... INSTEAD OF EVERY SIXTH FAMILY... WILL HAVE $2,000 OR MORE TO SPEND.



CONSUMER INCOME

U. S. business can look forward to a 1950 consumer market twice as large as in the worst year of the depression, half again as large as in 1929, and one-fifth larger than in 1941. That is the major conclusion of the 20th Century Fund's analysis of consumer purchasing power. Here are the steps by which it arrives at that conclusion:

1. With gross national product at $177 billion in 1950, past experience indicates that income payments to individuals would run to $138 billion.

2. Income tax rates are assumed to equal the 1942 schedules, so individuals would pay $11 billion in taxes (as against $19 billion in 1946).

3. Savings are estimated at $12 billion, or about 9% of income after taxes.

4. Subtracting taxes and savings, consumer purchases of goods and services would total $116 billion.

LOWER SAVINGS

Many experts would criticize the assumption that savings will amount to only 9% of income. Some of them look for a ratio as high as 20% in prosperous postwar years. The 20th Century Fund justifies the use of a low figure on three grounds: (1) people built up reserve of savings during the war; (2) expanding social security will reduce the need to save for old age; and (3) taxes will cut into savings. The Fund's estimate of savings plus taxes in 1950 adds up to a higher percentage of income than in prosperous prewar years.

The standard of living won't rise as rapidly as the total income going to consumers, because the increased income will be split up among more family units. But the average consumer unit (a family or a single person living alone) will be a third better off in 1960 than in the 1930's.

Shifts in the distribution of income will be even more important, from a marketing standpoint, than the general increase in over-all consumer income. More consumer units will be in the over-$2000 brackets than ever before and this group will be receiving a much larger share of total consumer income.

Part of the apparent increase in income is cancelled out by higher prices. To show the actual increase in purchasing power, the figures should be adjusted for an estimated one-third increase in the 1950 price level over that of the mid-1930's. This would mean that a $2,650 income in 1950 would buy no more than a $2,000 income in 1935-36. Even if this adjustment is made, the resulting figures still show a striking upward shift.

Income Class	Consumer Units in Millions		Cash Income in Billions	
	1935-56	1950	1935-36	1950
Total	39.2	47.9	$85.0	$135.0
Under $1000	20.8	13.0	17.0	7.7
$1000-2000	12.2	12.9	28.1	21.5
$2000-5000	5.5	18.2	23.8	62.1
Over $5000	0.7	3.8	16.1	43.7

In addition to dollar income, shown in the above table, consumers also receive "income in kind"—food and fuel produced by farmers for their own use, board and lodging received by domestic servants. Such income will have a value estimated at $3.3 billion in 1950, most of which will supplement the $7.7 billion received by those in the "under $1000" bracket.

FOR CONSUMERS

The urban market will continue to be far more important than the rural market. Consumer units in cities will receive cash incomes of $3,445 on the average in 1950, more than twice the farm average of $1,635 and almost twice the small town average of $1,880.

THE FARM MARKET

These figures don't provide an accurate measure of the relative importance of the rural and urban markets because rural consumers pay a lot less for food, fuel, shelter and so have more to spend for other things. If there were any way to adjust for these things, the figures would show a smaller spread between the two markets, but the urban market will still be dominant.

All these figures underline a general upgrading in consumer demands which would accompany high-level production and employment. It will have a profound effect on marketing practices. The average person will eat better, dress better, and live in a better house with better equipment. And he will have more money to spend for travel, recreation, and luxuries.

CONSUMER MARKETS

The improvement in living standards during the 1950 decade will lead to important changes in the way consumers spend their dollars. Even though they will eat better, dress better, and live in better houses, a smaller share of the consumer dollar will be spent on food, clothing and shelter. A growing share will go for appliances, furniture, travel, and recreation.

This means that the fastest growing markets will be those providing what might be called "optional" goods and services — things which add to comfort and enjoyment but which are not strictly necessary. Markets for necessities, on the other hand, will expand at a slower rate than total consumer expenditures.

The growing importance of "optional" goods and services is one of the reasons why it's increasingly difficult to keep our economic machine going on an even keel. The purchase of "optional" goods can be postponed with little hardship. So anything that causes people to put off buying a new car, a new house, or a new radio has a far greater effect on production and employment now than it did when the major share of the consumer dollar went for necessities.

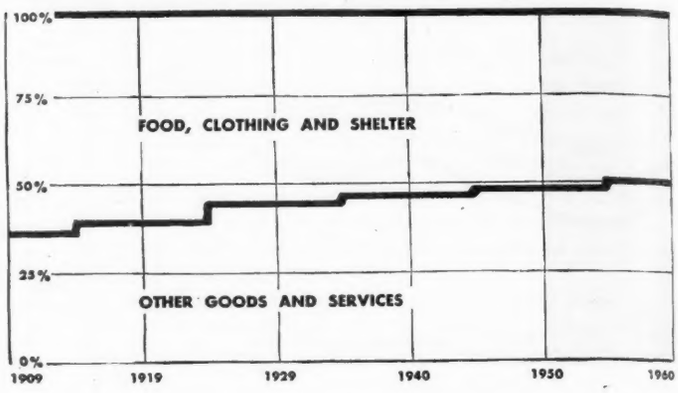
Some of the trends in major markets are summarized in the following sections.

FOOD

Although food is by far the largest item in the consumer budget, its relative importance is declining slowly as living standards rise. People eat the same number of pounds of food they ate in 1909 but the food is better from a nutritional standpoint and easier to prepare. Thus, the trend favors fruits, vegetables, and dairy products as against meat, potatoes, and bread.

More and more food is being processed in factories rather than in consumer kitchens. Improved methods of manufacture and distribution have transformed the luxury foods of yesterday into the standard foods of today. New kinds of processed foods — canned, frozen, and dehydrated — are appearing constantly.

STANDARD OF LIVING YARDSTICK: MORE OF THE CONSUMER DOLLAR GOES FOR THE COMFORTS OF MODERN LIFE



CLOTHING

Three long term trends will shape the clothing market in the future: (1) the shift from home and custom to factory fabrication is almost complete;

WHERE CONSUMER DOLLARS GO

(Figures in Billions of Dollars)

	1909	1919	1929	1940	1941	1950 (1944 Prices)	1960 (1944 Prices)
Total Consumer Expenditures	28.8	60.8	80.3	70.6	80.4	116.2	134.2
Food, Liquor, and Tobacco	9.9	22.3	23.7	21.9	25.3	36.2	41.1
Food	7.4	18.8	19.9	16.4	19.0	27.2	30.8
Liquor and Tobacco	2.5	3.5	3.7	5.5	6.3	9.0	10.3
Clothing and Personal Care	4.4	9.8	12.1	9.8	11.5	16.2	18.7
Housing	6.8	10.1	14.4	12.6	13.3	19.3	21.4
Rent a.	5.5	7.9	11.3	9.1	9.7	14.0	15.4
Fuel	1.0	1.5	1.7	1.7	1.8	2.5	2.8
Electricity	0.1	0.3	0.6	0.9	1.0	1.6	1.8
Household Equipment and Operation	2.8	6.2	10.6	8.7	10.3	15.0	17.4
Appliances	0.2	0.4	0.8	1.0	1.3	1.8	2.4
Consumer Transportation	1.6	5.2	8.6	7.3	8.6	12.7	16.4
Autos and Private Planes b.	0.6	3.5	6.0	5.7	6.8	9.6	12.7
Local Bus and Street Car	—	—	0.8	0.7	0.8	1.5	1.5
Intercity Bus	—	—	0.1	0.1	0.2	0.2	0.2
Airlines	—	—	c.	c.	c.	0.1	0.5
Railroads	0.4	0.8	0.6	0.3	0.3	0.4	0.3
Medical Care, Insurance, and Death Expenses	1.1	2.8	4.5	4.7	5.2	7.7	8.7
Recreation	0.9	2.1	3.8	3.3	3.7	5.7	6.9
Radio and Television Sets	0.2	0.7	1.0	0.6	0.8	1.1	1.3
Private Education, Religion, and Welfare	1.2	2.2	2.7	2.3	2.4	3.4	3.7

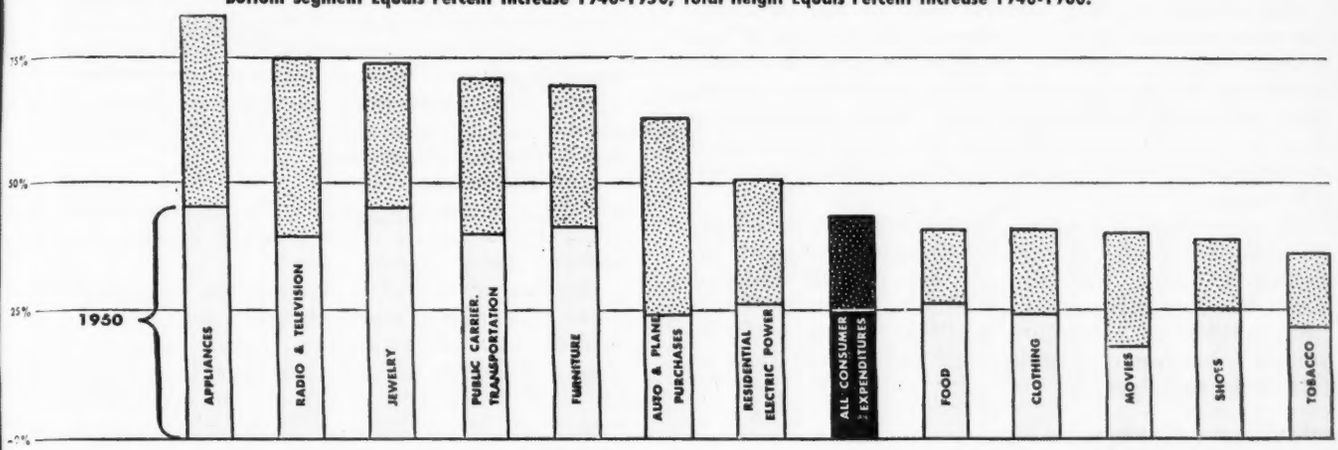
a. Includes Estimated Rent for Owner-Occupied Homes.

b. Includes Original Cost and Operating Expenses.

c. Less than $50 Million.

CONSUMER MARKETS IN 1950 AND 1960: Percent Increase in Sales Over 1940

Bottom Segment Equals Percent Increase 1940-1950; Total Height Equals Percent Increase 1940-1960.



(2) synthetics, chiefly rayon and nylon so far, are replacing cotton, wool, and silk at an accelerating pace; (3) there's greater standardization of styles and a trend to lighter and simpler clothing.

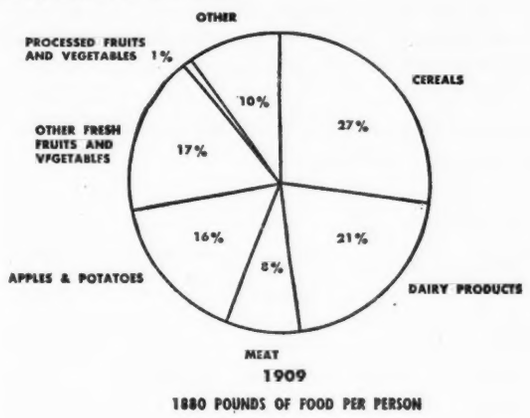
In 1909 consumers spent 14% of their income for clothing but by 1940 the ratio had reclined to 12%. However, this long run decline may be halted or reversed. The migration from farms to cities, the upgrading of incomes, and the growing demand for sports clothing will increase clothing expenditures.

HOUSING

The decline in the relative importance of housing expenditures — from 24% of consumer dollars in 1909 to less than 18% in 1940 — is expected to continue. The reason is that people feel they get more value for their dollars in other things than housing. Nevertheless, the housing market should be much larger in the 1950's than in the 1930's because much of our housing needs to be repaired or replaced.

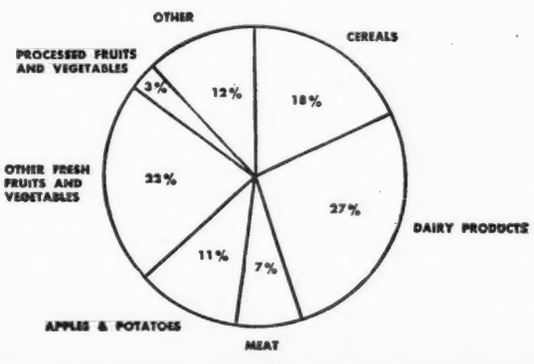
A Census survey in 1940 showed that 16 million of the nation's 37 million dwelling units needed to be replaced or needed major repairs. The 20th Century Fund estimates that the provision of adequate housing for everyone by 1960 would involve building 20 million new units and rehabilitating 5.4 million at a total cost of $115 billion (1944 prices). The Fund also estimates that we will fall 15% short of this goal even with continued high-level employment.

OUR CHANGING DIET: MORE MILK, FRUITS AND VEGETABLES LESS MEAT, POTATOES AND BREAD



1909

1880 POUNDS OF FOOD PER PERSON



1939

1882 POUNDS OF FOOD PER PERSON

HOUSEHOLD EQUIPMENT

More and more of the consumer dollar has gone for household equipment in the past four decades, largely because of the development of labor-saving appliances. The outlook is for a continuation of this trend. New appliances are being developed; and the large number of new houses slated to be built in the next few years, the wartime and postwar boom in the number of families, and the migration to the cities should add to appliance demand. The same factors should brighten the outlook for furniture, rugs, and other household items.

Some appliance markets may be saturated by the 1950's, however. A few years of high production would fill our homes with refrigerators, for example. However, replacement demand would run to 2.7 million units in 1960 and there would be a demand for 1.3 million refrigerators to equip new houses, so the market would still be bigger than in 1941 when 3.6 million were sold. However, new products must be developed if the industry is to keep up the pace it has set in the past.

TRAVEL

In 1916 the average person traveled 400 miles. By 1940 the average had grown to 2,400 miles, chiefly because of the rise of the automobile. The 20th Century Fund expects this growth to continue because as their incomes rise people spend more money traveling.

A good share of the increased spending will go to purchases of cars and planes. The Fund estimates that there will be 36 million cars on the road and 100,000 private planes in the air in 1950. The auto industry would be able to sell 5 million new cars a year after 1950 — 4 million for replacement and a million for population growth.

CAPITAL INVESTMENT

Investment plays a crucial role in our economy for two reasons. It is by plowing back part of our annual output that we are able to provide better machines and equipment to keep productivity rising. But the amount ploughed back varies widely from year to year. This unevenness of capital investment contributes to the instability of production and employment.

Because capital investment involves the purchase of durable goods, it can be postponed almost indefinitely when the outlook for profits darkens. Thus, capital investment plummeted from $18 billion in 1929 to $5 billion in 1933, a drop of 72%, whereas consumer spending fell only about half as fast in the same period.

MORE FOR EQUIPMENT

There has been an important shift in the relationship between construction and equipment, the two major types of investment. Before World War I, construction made up around three-fourths of total investment but the ratio declined to less than half in 1935-39. Part of the decline is, of course, explained by the fact that the depression left us with ample plant capacity but provided an incentive to buy more efficient machines to cut costs. Nevertheless, there is a well-defined trend towards allocating an increasing proportion of investment to equipment rather than to plant construction.

CAPITAL INVESTMENT . . .

A little less than two-thirds of total investment goes into industrial plants and equipment. Housing and other consumer construction (hospitals, schools, churches) averaged 27% of total investment during the interwar period. Housing fell from a peak of $6 billion in 1926 to $4.7 billion in 1929 and $600 million in 1933; and it had recovered only half the 1926 volume by 1940.

While other types of investment follow the ups and downs in general business, investment in housing construction follows a cycle of its own. This housing cycle is determined by factors such as the vacancy rate, the level of rents, and that of construction costs, which may not follow the trend of general business. When a drop in general business activity takes place during a declining phase of the housing cycle, as it did in 1929, the result is a deep and prolonged depression.

Government investment, of which the largest component is highways, has been much more stable than other types but it doesn't swing enough weight to stabilize total investment.

Because of the wide fluctuations in capital investment, it's much more difficult to estimate future capital expenditures than future consumer purchases. In order to make a relatively stable forecast, the 20th Century Fund bases its estimates on the long term trend since 1879, which shows a slight decline in the share of total output going to capital investment. Thus, investment under conditions of stable prosperity in the 1950 decade is estimated at 16% of total output as compared with a ratio of more than 18% in the late 1920's. On this basis, estimated capital expenditures work out to $28 billion for 1950 and $33 billion in 1960. Our ability to maintain high employment and rising living standards will depend in large measure on our ability to invest that much profitably in new machinery and buildings.

CAPITAL NEEDS

Analysis of our capital needs lends little support to the idea prevalent during the 1930's that we had reached economic maturity so that there was no way to invest as much as we had in earlier decades. No one has ever made an estimate of how much it would cost to modernize our industrial plant, which is valued at around $200 billion at prewar prices. If as much as a third of it needs to be replaced or rehabilitated, around $100 billion (current prices) of additional investment will be required.

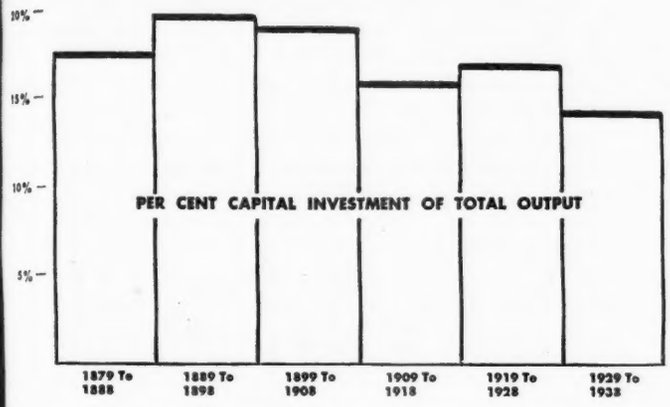
In addition, huge amounts of money need to be invested in housing and public works to raise the serv-

WHERE INVESTMENT DOLLARS GO

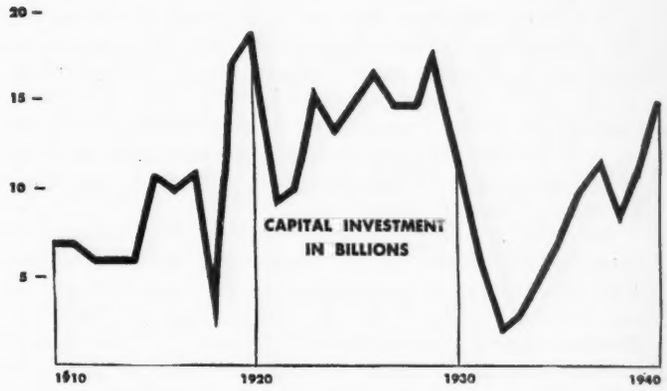
(Figures in Billions of Dollars)

	(Annual Averages)					(1944 Prices)	
	1920-1924	1925-1929	1930-1934	1935-1939	1940-1944	1950	1960
Total Capital Investment	$12,428	$17,186	$8,215	$10,445	$12.340	$27,700	$33,000
All Industries	7,570	10,112	5,272	6,889	8,089	17,800	21,125
Manufacturing	1,996	2,362	1,074	1,610	3,731	4,200	5,025
Food	261	357	194	244		228	273
Textiles	227	212	92	117		175	210
Steel	138	188	110	192		853	1,021
Autos	105	150	78	146		369	441
Chemicals & Petroleum	70	95	68	142		928	1,111
Machinery	—	—	—	28		180	216
Other	510	625	213	409		1,462	1,750
Transportation	1,797	2,303	1,277	1,822	805	4,300	5,100
Commercial	1,196	1,940	777	719	833	1,950	2,300
Utility	693	999	483	422	780	1,500	1,625
Other	1,888	2,508	1,661	2,316	1,940	3,950	4,700
Consumer Construction	3,806	5,557	1,547	2,256	2,912	7,200	8,255
Government Construction	1,052	1,517	1,396	1,299	1,338	2,700	3,620

OVER THE YEARS ABOUT 1/5 OF TOTAL OUTPUT IS PLOWED BACK AS INVESTMENT



BUT THE AMOUNT PLOUGHED BACK VARIES GREATLY FROM GOOD YEARS TO BAD, ACCENTUATING THE SWINGS OF THE BUSINESS CYCLE



ices provided merely to adequate levels. The 20th Century Fund estimates that the cost of a 15 year program to modernize our city streets and rural highways would run to $40 billion. To bring the nation's housing up to minimum standards of health and decency by 1960 would cost $115 billion. To conserve our natural resources and develop our water power would cost $27 billion over a 15 year period.

There seems to be little question that needs exist for all the capital investment we can make for a long time to come. The behavior of investment in the past strongly suggests that the problem is not one of lack of needs but one of finding ways to add to our capital in an orderly fashion. Capital investment has followed the boom and bust route in the past; what is wanted is a high but steady rate of investment.

WARTIME INVESTMENT DEFICIT

Demand for capital goods is stronger right now than ever before, largely because of the backed-up needs arising out of the war. Here is how wartime expenditures for capital goods which can be used in peacetime production compared with expenditures in the last 5 years of both the 1920's and 1930's: (Figures in billions of dollars)

	1925-1929	1935-1939*	1940-1944
Total Capital investment	$86	$65	$49
Industrial	51	43	32
Manufacturing	12	10	14
Metals, chemicals, machinery, petroleum	6	6	11
All Other	6	4	3
Commercial	10	5	3
Railroads	5	3	3
Electric power	5	3	3
Consumer Construction	28	14	12
Public Works	7	8	5

* Adjusted to Wartime Prices

Wartime restrictions held investment in all civilian lines far below what would be spent in prosperous peacetime years. Thus, there was a backlog of investment needs at the end of the war which ran to more than $30 billion, if the 1925-1929 demand can be taken as typical. Whatever the precise size of the backlog, it is clearly great enough, when added to the normal yearly demand for new investment, to keep the heavy goods boom going for some time to come. The test of our ability to stabilize capital investment will come later.

There is also a huge foreign demand for American capital. How far we will go toward meeting this depends largely on whether international political and economic conditions are stable enough to make private foreign investment a good risk.

If we invest abroad in the same proportion we did in the late-1920's, our foreign investments will total $1.6 billion during the year 1950 and $1.5 billion in the year 1960. This will mean a net increase in our foreign holdings of $15 billion during the 1950's, raising the total of such holdings to about $25 billion, as against a total of $10.6 billion in 1940.

To make that much foreign investment pay out, an expanding volume of world trade would be required. Foreign nations would have to get enough dollars not only to pay for goods they bought from us but also to pay interest and dividends on U. S. investments. If our overseas investments increase to $25 billion by 1960, annual interest and dividends owed us will run to almost $1¾ billion.

To pay us that much, foreign nations would have to sell much more in the U. S. than ever before. The 20th Century Fund calculates that imports of $7.3 billion in 1950 and $8.1 billion in 1960 would provide other countries with the dollars they need. Imports ran to $2.5 billion in 1940 so we would have to buy 3 times as much abroad to keep expanding our foreign investments.

With good business, U. S. demand for imported goods should be well above prewar. Rising living standards will widen the market for such consumer items as British tweeds and French perfumes. Moreover, we will need to import more raw materials than ever before because we used up our natural resources at a prodigious pace during the war.

NEW INDUSTRIES

The new methods, materials, and products developed during the war may well have a more profound and lasting effect on future capital requirements than the backed-up demands accumulated in wartime. Here are some of the wartime developments which may have important peacetime applications: new chemical processes and products including synthetic rubber, plastics, synthetic fibers and fabrics; new food products and new methods of food processing; new uses for glass, plywood, and the light metals; tremendous advances in aviation; and new applications of atomic energy and fissionable products in power production and medicine.

Large capital expenditures will be required to push these developments further and adapt them to civilian use. New businesses and perhaps entire new industries will grow up, adding to the demand for capital goods for many years.

THE COST OF GOVERNMENT

To the traditional certainty of death and taxes can be added the certainty that the cost of government will take a much larger share of national income than ever before in peacetime. After the Civil War and again after World War I, federal expenditures moved up to a level four times prewar. And it is already clear that World War II is going to have about the same effect.

In 1940, federal, state, and local governments spent $19 billion, of which a total of $2.2 billion went for national defense, veterans, and interest on the war debt. By 1950, the 20th Century Fund estimates that all governmental units in the U. S. will be spending more than $45 billion. Federal expenditures are estimated at $27.6 billion in that year as against $9 billion in 1940.

Part of the increase is explained by higher postwar prices. Adjusting for price changes would reduce the 1950 figure from $45 billion to $33.5 billion. This is still 80% above the 1940 level. Increased expenditures for public works, social insurance, and schools explain another small part of the rise.

But costs arising out of the war are by far the most important factor. Military and veterans' expenditures and interest on the war-swollen national debt will add up to over $17 billion in 1950. This is only 10% less than total government expenditures in 1940.

The only major category of government expense which would be lower in 1950 is welfare. With high-level employment and more social insurance, relief and other welfare costs should run to $2.5 billion in 1950 as against $3 billion in 1941.

The following paragraphs describe important trends in the major items of government expense.

MILITARY

The 20th Century Fund assumes that we will maintain an armed strength of 2 million men (including trainees) and that it will cost $3,300 to equip and maintain each man, so total military expenditures will run to $6.6 billion. But even if we decide to maintain a smaller armed strength, the total cost might easily be at least $6.6 billion because the present per serviceman cost of over $6,000 a year may not decline.

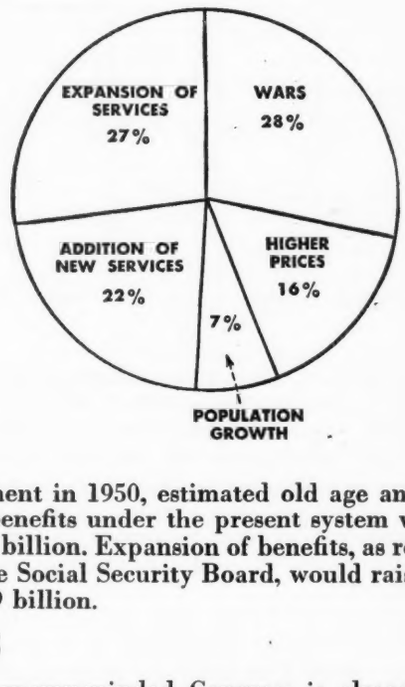
VETERANS

It will cost at least $2.9 billion to take care of veterans in 1950 even if benefits are not increased. That's 5 times the 1941 cost. Pensions for World War I veterans rose steadily from $116 million in 1924 to over $300 million in 1945. That rise will continue for another 20 years. By far the largest expense will be for World War II pensions which are already costing $900 million. Disability and death benefits will cost about $1¾ billion in 1950; hospitalization will add another $250 million; and insurance $150 million.

SOCIAL SECURITY

Future expenditures for social security will depend on whether steps are taken to extend coverage and liberalize benefits. Over 60 million people are now covered so the cost is certain to increase rapidly as more of them begin to draw payments. With high-level employment in 1950, estimated old age and unemployment benefits under the present system would run to over $5 billion. Expansion of benefits, as recommended by the Social Security Board, would raise the cost to over $9 billion.

WHY THE COST OF GOVERNMENT HAS INCREASED. The $25.6 billion increase in cost from 1913 to 1941 was due to:



PUBLIC WORKS

Even an economy-minded Congress is almost certain to go along with expenditures for highways, airports, waterways, flood control and conservation. Thus, an increase in expenditures for transportation and natural resources from less than $2.5 billion to over $5 billion in 1950 seems probable.

SCHOOLS

Education ranks third among all government expenditures. In 1941 we spent almost $2.5 billion—10% of all government dollars—on schools. Teachers' salaries account for almost three-quarters of the total cost so the trend towards higher salaries will boost the nation's bill for education.

WHERE TAX DOLLARS GO

(Figures in Billions of Dollars)

	1913	1932	1941	(1944 Prices) 1950	1960
All Government Expenditures	2.5	12.4	23.1	45.5	50.7
Federal	0.7	4.3	12.9	27.6	28.6
State	0.2	1.8	3.6	7.0	9.3
Local	1.6	6.3	6.6	10.9	12.8
Military	0.27	0.7	6.1	5.6	6.6
Veterans	0.18	0.8	0.6	2.9	3.2
Interest	0.15	1.3	1.7	7.9	8.1
Social Insurance	—	0.2	1.9	7.7	8.7
Welfare & Health	0.31	1.5	4.1	4.0	4.1
Education	0.65	2.5	2.7	3.7	4.3
Public Works	a.	a.	a.	5.6	7.1
Transportation	0.40	1.9	2.0	1.8	2.7
Natural Resources	0.03	0.6	1.4	1.2	1.1
Police & Fire	0.19	0.7	0.7	1.0	1.1
Other	0.40	2.4	2.0	3.0	3.6

a. Included in other groups.

ATURAL RESOURCES

The war left the U. S. with a depleted supply of ost natural resources, and with critical shortages f some of the most essential minerals. Nevertheless, ck of natural resources should not be a limiting ctor on our productive capacity. With relatively ee access to world markets, we should be able to et all the raw materials we need. And, even if we ere denied access to world markets, we could use ur low-grade reserves and develop substitutes with- ut causing a prohibitive reduction in our living tandards, though everyone would feel the effects in ne way or another.

The U. S. economy consumes about a billion and half tons of raw materials each year, or about 11.5 ons per person. Of this 3.5 tons are coal, 1.5 tons re petroleum, and iron and copper ore each con- ribute about a half a ton. In 1939 the value of un- efined minerals output was $4.2 billion and 2% of ll workers were engaged in mining or lumbering.

UTURE REQUIREMENTS

The level of industrial production projected by the th Century Fund would raise minerals requirements third above 1940 by the year 1950 and 50% above 40 a decade later. Here is how natural resources equirements in the 1950 decade would compare with 40 and the wartime peak: (Index numbers, 1940 quals 100)

	Wartime Peak	*1950*	*1960*
ll minerals	138	133	151
Metals	157	117	126
Fuels	130	141	164
Other	141	128	142
mber	126	93	76
ectric Power	159	173	224
nufactured Gas	120	94	75

The capacity of our supplies of natural resources support future levels of output cannot be deter- ined with any great accuracy. It will depend on the size of our reserves and on our ability to use supplies more econom- ically and develop substitutes.

THE URCES ABLE . . .

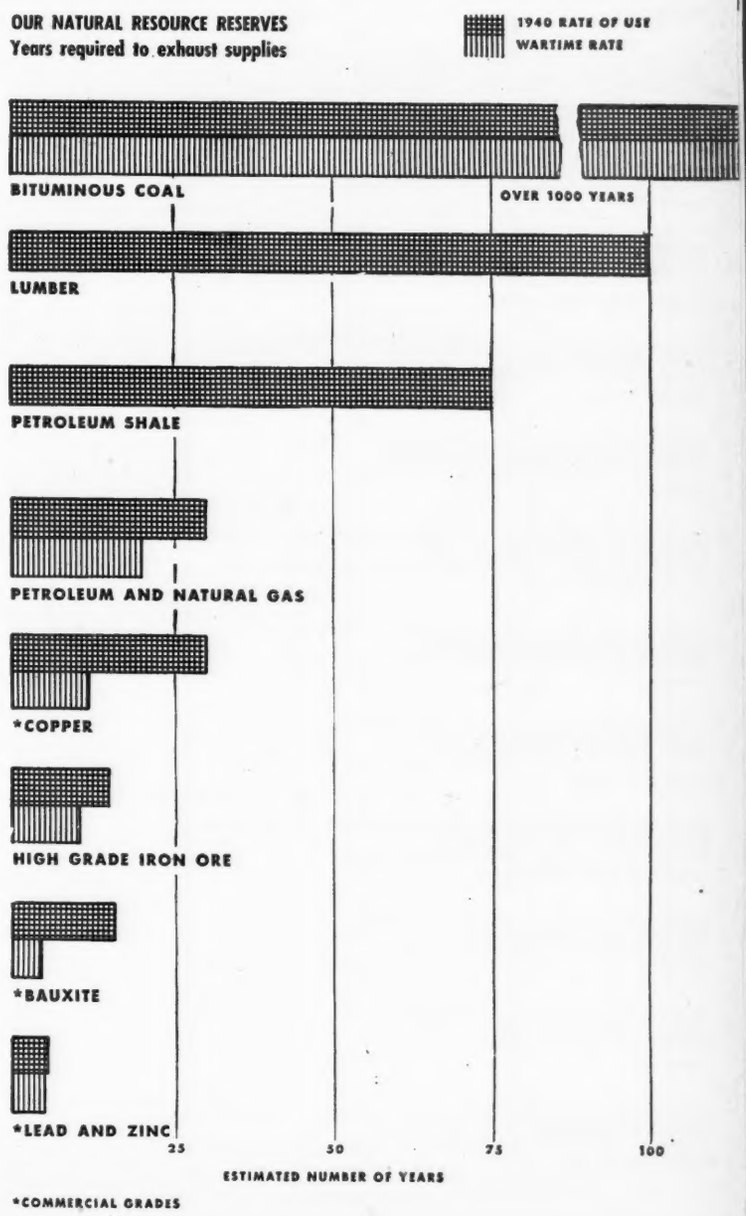
Because there is no way to meas- ure these factors with any degree of precision, all estimates of the num- ber of year's supply are subject to wide errors. However, such estimates are useful in directing attention at those resources where every effort should be exerted to develop new pplies, substitutes, and more economical methods use.

GGEST PROBLEMS: LEAD AND ZINC

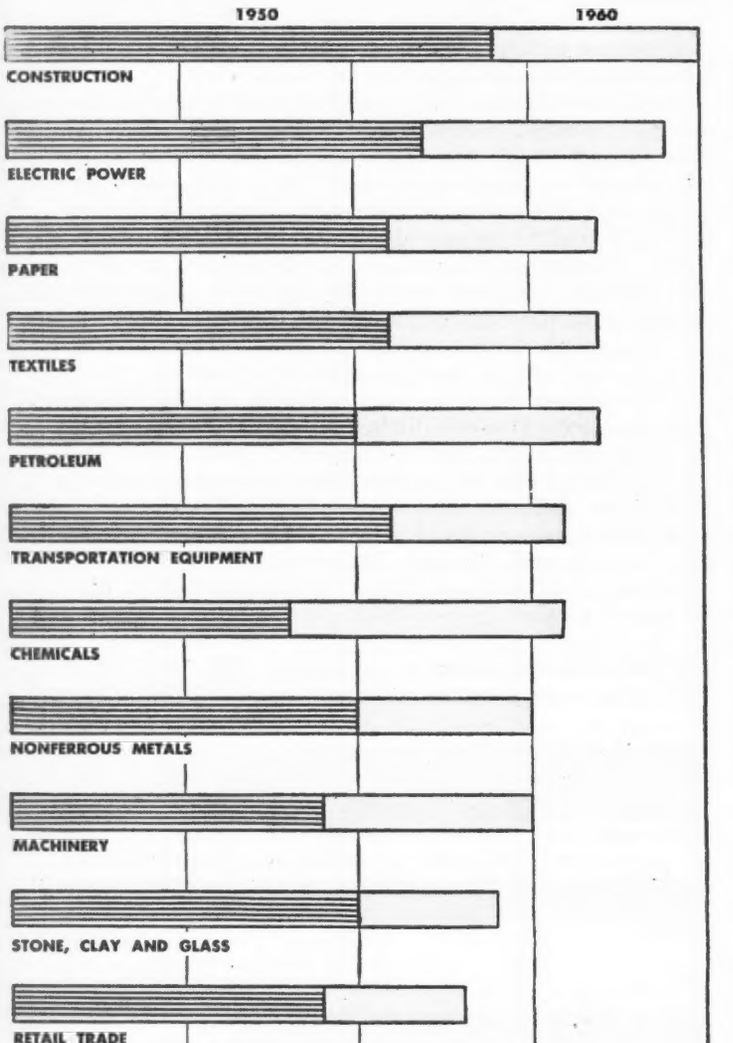
Commercial grades of zinc, lead, and bauxite will exhausted before 1960 even if the rate of use is to half the wartime rate. Supplies of petroleum d natural gas — which furnish 40% of our energy ill last longer than 20 years but their partial de- tion will raise many technical and economic prob- ns long before that time. Possible exhaustion of h-grade deposits of such minerals as iron and pper in the foreseeable future will stimulate de- opment of processes to use low-grade deposits. We have been discovering more and more ways to tch our supplies of natural resources, however. the case of tin, the electroplating process saves 50% of the tin used in tinplate production. The electric power industry uses less than 40% as much coal per kwh now as in 1920. The development of new materials and new ways of using old materials also expands our resource capacity.

Our bituminous coal reserves are adequate for over a thousand years even at the wartime rate of use, though production costs might rise substantially as inferior coal beds were used. After that, there are huge deposits of sub-bituminous coal and lignite which could carry us along for another thousand years. In comparison, maximum petroleum reserves are minute, adequate only for about 30 years consumption at the current rate. That is why the experts are trying to find ways to produce oil from coal cheaply enough to be commercially feasible.

Even though we have been using up lumber faster than it grows, there is little doubt that enough will be available in the future to meet at least minimum needs. Annual timber growth runs to about 32 billion board feet. But we cut over 40 billion board feet a year before the war and lost another 6 billion through fire, insects, and disease. An adequate conservation program could increase annual growth enough to offset this depletion.



PRODUCTION PROSPECTS: Estimated Percentage Increase in Industrial Activity Over 1940



INDUSTRIAL CAPACITY

At the end of World War II U. S. industry found itself with surplus capacity in some lines and serious deficiencies in others. There was more than enough aircraft, machine tool, and synthetic rubber capacity but not nearly enough sheet steel, copper, or electrical machinery capacity to meet pent-up demands.

War experience showed, however, that industrial capacity can be expanded enormously in a few years, given the need and the funds. Thus lack of industrial capacity should not prove a bottleneck to meeting the demands of consumers in the 1950 decade.

A rough estimate places our total investment in industrial facilities (manufacturing, mining, transportation, and distribution) at $200 billion. Just how much capacity industry as a whole, or any given industry, has is impossible to measure.

Capacity is a most elusive concept. In a technical sense, the capacity of an industry is the combined production of all its plants working 24 hours a day, 365 days a year, less an allowance for repairs, breakdowns, and other technical factors. Actual capacity is far less, however. Some facilities are obsolete or high-cost. Supplies of raw materials and components may be insufficient to keep assembly plants running full-steam. Moreover, demand for many products isn't great enough to support round-the-clock production.

PLENTY OF CAPACITY

During the past quarter century, however, experience shows that we have had more than enough overall capacity, and more than enough capacity in almost every industry, to meet all demands. An extensive study showed that even in 1929 only the steel and machine tool industries were definitely operating at capacity.

The growth of productivity as old machines are replaced with new and more efficient ones and as new techniques are developed is one of the main reasons why industrial capacity more than keeps pace with markets. The depression of the 1930's led to a net retirement of about 5% of total manufacturing facilities but manufacturing plants in 1939 could have turned out a quarter more than in 1929 because productivity was a third higher.

Whenever an industry's output begins to approach technical capacity, it becomes profitable to purchase new and more efficient equipment to replace or supplement existing machines so that a certain amount of excess capacity seems to be inevitable in a free enterprise system.

Estimates of the level of industrial production in different lines under conditions of high-level employment during the 1950 decade are shown in the chart. They assume that past trends will continue so that they give only a rough idea of what would happen to output in each industry. Unpredictable shifts of consumer demand or new product developments might cause a big change in the pattern of industrial production. Such estimates are, nevertheless, useful in that they provide a clue to lines where the largest increases may take place.

None of the projected increases are so large as to tax our ability to provide enough capacity. This is not to say that there will be no bottlenecks because of lack of capacity for certain components, for instance. However, we should be able to make good in short order any deficiencies of that sort that may develop.

DEMANDS VERSUS NEEDS

Despite the substantial increase in living standards which would be possible with high-level production and employment in the 1950 decade, many U. S. consumers will be unable to buy enough of life's necessities to maintain themselves at a health and decency level. Almost 30% of all families would receive less than $1,000 a year cash income and one-third of this group would receive less than $500.

The 20th Century Fund asked a series of experts to estimate the quantities of food, clothing, housing, medical care, and other things needed to provide a standard of living at a minimum health and decency level. The experts also figured out how much it would cost to bring everyone expected to be below that standard in 1950 and 1960 up to the calculated level. In other words, the estimates show the cost of establishing a "floor" for consumption without disturbing the spending patterns of those who received more than enough income to satisfy the calculated minimum needs.

ESTIMATES OF NEEDS

Any estimate of "needs" must rest upon someone's opinion as to what constitutes "health and decency" in this day and age. In the case of food, the nutritional requirements of a minimum health and decency standard can be determined accurately. In other fields, such as housing and education, even the experts would disagree over what constitutes a minimum standard.

However, what is important is not the precise size of the estimates but their general magnitudes. The conclusion that we would have to spend about 50% more on medical care than we are likely to in 1950 is important even if the experts' appraisals of the deficit range from as high as 60% to as low as 40%.

To fill total needs calculated in this manner would require production of $200 billion of goods and services in 1950 or 13% more than the $177 billion which would be turned out with high-level production and employment. In 1960, estimated production would fall short of needs by 8%. Food accounts for the biggest share of the deficit but needs outrun demand by important margins in housing, medical care, education, and social security.

MEET

MOST ALL

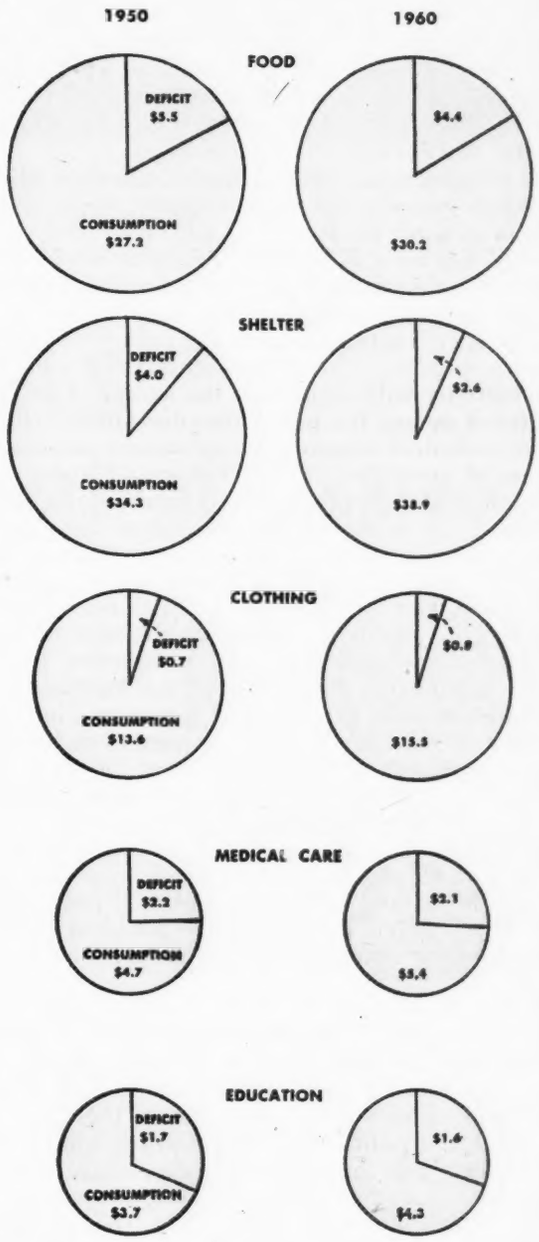
UR NEEDS

To provide nutritionally adequate moderate-cost meals for those unable to afford them would add $5.5 billion to the $27.2 billion that would actually be spent on food in 1950. This assumes no change in diets of those with adequate incomes despite the fact that many people in those groups do not eat what they should. If we all ate what we needed, we would consume twice as many fresh vegetables as in 1940, half again as much milk, more fruits and tomatoes; and we would eat smaller quantities of sugar, sirups, fats, and oils. This better diet would cost us less than we will actually spend for food in 1950.

So large a portion of our existing housing is unsatisfactory by any reasonable standards that it would take 10-15 years to provide everyone with adequate housing. One of the reasons why we don't have adequate housing is that many consumers cannot afford to pay enough rent to finance it. Estimated expenditures in 1950 for rent (including the estimated rental value of owner-occupied homes) would run to $14 billion as against an estimated need of $16.4 billion.

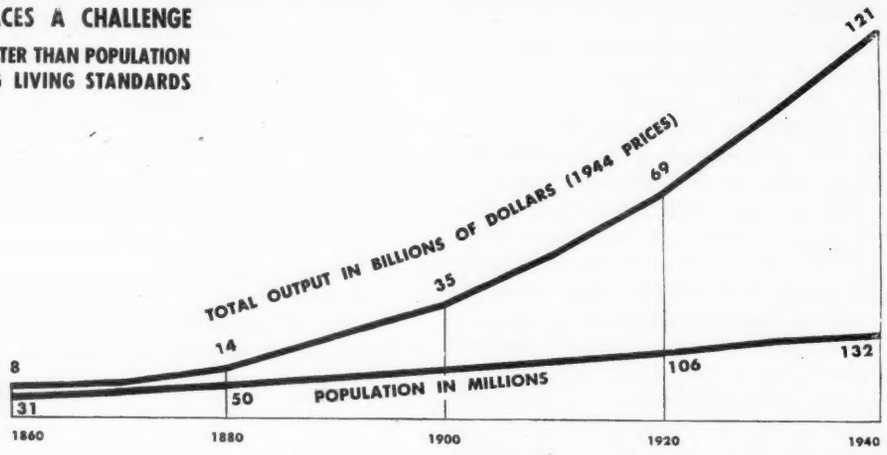
Vast advances in medicine have gone far toward eliminating many diseases and have brought about a steady improvement in the standard of health. However, large numbers of people in the lower income groups cannot afford adequate medical care. Moreover, to supply good medical care for everyone under the traditional fee-for-service basis would cost several times more than consumers have ever spent for medical services even in prosperous years. Development of an effective form of group medicine, however, would make it possible to provide adequate care at a great saving over present costs, according to the 20th Century Fund.

HOW CONSUMPTION WOULD COMPARE WITH TOTAL NEEDS
(Figures in billions of dollars)



THE U. S. ECONOMY FACES A CHALLENGE

PRODUCTION HAS GROWN FASTER THAN POPULATION GIVING PROMISE OF RISING LIVING STANDARDS



The major conclusion of the 20th Century Fund's survey of America's needs and resources is that we have reached a point where we can provide everyone with a decent living and most people with a living which, by any standards other than our own, is positively luxurious. With high-level employment, it would take only a 13% increase in total output in 1950, and an 8% increase in 1960, to lift everyone to a minimum health and decency standard of living.

We have more than enough industrial and agricultural capacity to support that much of an increase in total production. Lack of natural resources should not be a bottleneck, for with world trade on any sort of a reasonable basis we will be able to get all the raw materials we need.

The only limiting factor is the capacity of our labor force to produce. The 20th Century Fund assumes that productivity will advance at the average rate actually achieved during the past 9 decades (18%). But there is no technical reason why we cannot achieve an increase of more than 30%. That would make possible enough production to meet our minimum needs.

The U. S. economy has exhibited two dominant characteristics in the past century. Our productive capacity has expanded at a rate never approached elsewhere. But our economy has also been highly unstable. Our problem is to make the most of our unparalleled technological and productive know-how while minimizing the swings of the business cycle.

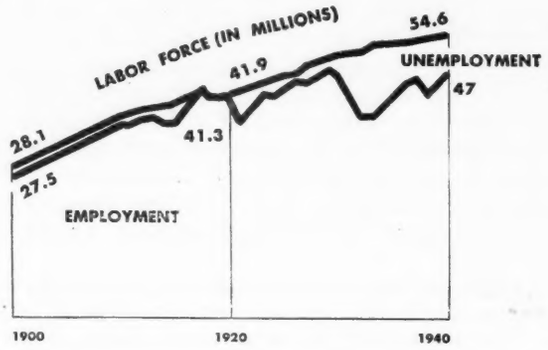
If we can meet that challenge, we can eliminate the specter of want and move on toward constantly rising living standards for everyone. Never before in history has a nation been so close to abolishing poverty and meeting the material demands of its citizens.

This is not to say that solving the problem of maintaining stable and expanding production would solve all our economic, social, and political problems. Nor is it to say that a solution of the problem of keeping our economic machine running on an even keel is at hand.

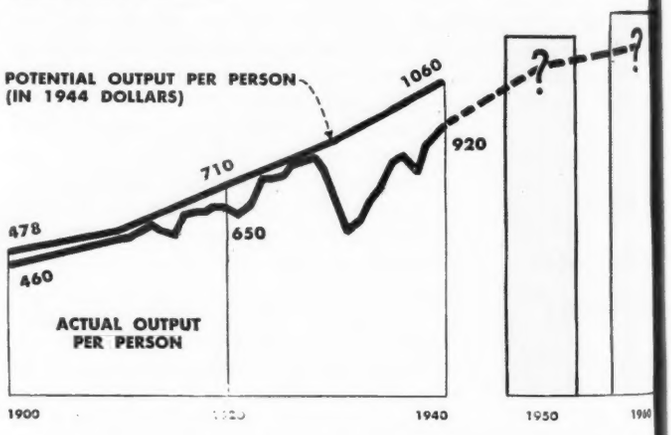
In the first place, the U. S. would not be a utopia even if we achieved the kind of high employment and production the 20th Century Fund is talking about. Many perplexing problems of how to best distribute our production would remain. Then there are a host of social and political problems which would still tax our efforts and ingenuity. Finally, there is the all-important question of how to maintain world peace.

Most people would agree that the problem of maintaining high employment and rising living standards is still far from solution. Our ability to mobilize and direct our economic resources so as to keep our economy running on an even keel has lagged behind our ability to solve technical production problems. Each businessman, each worker, and each consumer must somehow learn to act differently in many ways than he has in the past if we are to solve our number one economic problem.

BUT THE GROWTH HAS FOLLOWED THE BOOM AND BUST ROUTE INVOLVING LONG PERIODS OF MASS UNEMPLOYMENT



CAN THE ECONOMY PROVIDE STEADY EMPLOYMENT AND RISING LIVING STANDARDS?



Just what changes in our economic life will be necessary no one knows. On our ability to find out these things and put them into practice in the next few years depends our success in meeting the challenge which the 20th Century Fund's study underlines. That challenge is that we have within our grasp the ability to eliminate actual want from the U. S. and to provide more and more things for better living for everyone.

Reprints of this report are available at a charge of 25¢ each to cover the cost of handling and mailing. Address orders to Department of Economics, McGraw-Hill Publishing Co., Inc., 330 West 42nd Street, New York 18, N. Y.

Making the first or box cut which is 60 ft. wide. The shovel in the background making the lead cut is equipped with a 2½-yd. dipper. Following it is the 2-yd. machine.

TANDEM SHOVELS
Increase Stripping Depth at Clearco

Two 2- and 2½-Cu. Yd. Shovels Working in Tandem Average 800 to 1,000 Tons Daily in 32-In. Sewell Seam — Usual Stripping Limit, 38 Ft. — Recovery Widths Are 60 to 300 Ft. With 7- to 18-Deg. Slope

★ ★ ★ ★ ★

WIDER CUTS, working to a greater depth and a concentration of equipment that simplifies supply and supervision are advantages of the tandem-shovel method of cropline stripping as practiced at the mine of the Standard Ore & Alloys Corp., Clearco, Greenbrier County, W. Va. Dippers on the shovels have capacities of 2 and 2½ cu.yd. Only one pit is operated at a time and the production is 800 to 1,000 tons per day.

This mine recovers the Sewell seam, averaging 32 in. in thickness and ranging from 18 to 48 in. The bed is free of continuous partings, the coal is low to medium volatile, is of good coking characteristics and is in demand for industrial purposes.

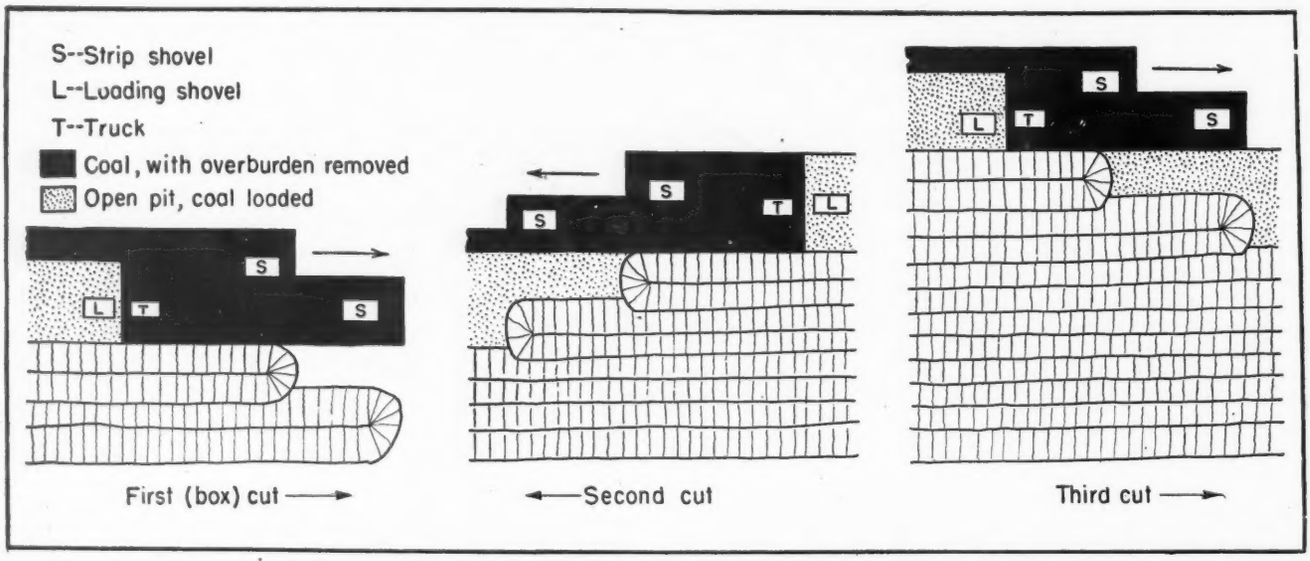
The stripping is on a lease of the Clear Creek Coal Co., which has a drift operation at Clearco and, for the most part, has mined from underground the areas where Standard Ore & Alloys' stripping is under way. In a large percentage of the crop stripping the excavation cuts into abandoned workings, but there are stretches where only solid coal is encountered.

Steepness of the hills ranges from approximately 7 to 18 deg. The usual limit of stripping is to a highwall of 38 ft., but in a few instances the work has been carried to 45 ft. Coal widths recovered range from 60 ft. to 300 ft.

Immediately above the coal is a 10- to 12-ft. stratum of blue slate, which must be shot. Next comes 8 ft. of hard shale that is dug by the shovels without shooting. The surface is a varying thickness of shaley top soil.

One stripper is a Lima 1201 Model L "High-Lift" with a 2½-yd. Pettibone-Mulliken dipper, 42-ft. stick and 32-ft. boom. It is powered by a Cummins diesel. The other is a Bucyrus-Erie 54B with 2-yd. Bucyrus dipper, 32½-ft. stick and 43-

This 2½-yd. lead shovel with 42-ft. stick and 32-ft. boom casts the dirt as far as possible over the hillside in making the first cut. Slopes of the hills vary from 7 to 18 deg.



Two stripping shovels of near equal capacities work in tandem but not necessarily as close together as this drawing depicts. As many as six cuts have been made.

ft. boom, driven by a Buda diesel. A Bay City Model 65 with 1¼-yd. dipper and Waukesha gasoline engine is used to load coal.

Auxiliary stripping and road equipment includes five Caterpillar D-8 tractors with bulldozer blades and one Rome 404, tandem-drive, full-hydraulic power controlled diesel-motor patrol grader, with a 12 ft. x ¾ in. blade. Two bulldozers work ahead of the strip shovels, clearing timber and making drains, and the other dozers and grader work at cleaning off the coal and making roads. Horizontal drilling for shooting overburden and vertical drilling for coal shooting are done with Hardsocg gasoline drills. Three Rex gasoline-driven pumps, 2 in. and 3 in., complete the list of pit equipment.

The two shovels, as shown in the accompanying diagram, work together, with one close behind the other. The outside track, or crawler, of the rear shovel travels practically over the path made by the inside track of the lead shovel. On the first, or box cut, 60 ft. of coal is exposed. Although the bottom beneath the coal is hard enough to haul on, all coal haulage is done on

the coal except in some cases when finishing a section of stripping. On the first cut the loading shovel follows the strippers and takes the outer 42 ft. of the 60-ft. width, leaving 18 ft. of coal berm next to the highwall for truck haulage.

At the far end of the pit the lead shovel on the first cut swings around into the highwall and on the second, or return, cut becomes the inside, or follow-up, shovel. On this retreating cut all the exposed coal is loaded. The next outgoing cut (the third) is essentially a repetition of the first, except that the width is less. Usually the second cut is 50 to 55 ft. wide; the third, 45 to 50 ft.; and the fourth, 35 to 45 ft. As many as six cuts have been made, the last ones running 30 to 35 ft. wide. Stripping is done during three shifts and coal is loaded one shift, usually eight hours.

With the horizontal drill, which is equipped with hydraulic feed and control, 5-in. holes 30 ft. deep are drilled on 18-ft. centers at an elevation 2 to 3 ft. above the top of the coal. Three cases (150 lb.) of Atlas 60-percent dynamite is loaded per hole. Coal is shot on 6-ft. centers, each way, with Atlas Coalite, 1½ sticks per hole.

Stringer beads of manganese are arc-welded on the top and bottom wearing surfaces of the teeth on stripping and loading dippers for added protection and to serve as an indicator. When they are worn off, it is time to build up the tooth and thus prolong its ultimate life. Stringer beads also are applied to new teeth before they are installed on a dipper.

K. M. Quigley, general superintendent, owns and flies his own plane from an airport near Lewisburg, W. Va. He uses the plane to make air surveys and take snapshots which help materially in planning, particularly in deciding where drainways should be excavated. In a number of instances he has reduced breakdown delays to a fraction of what they might have been by flying his plane to Pittsburgh or other manufacturing centers to secure emergency repair parts.

Truck Haulage Contracted

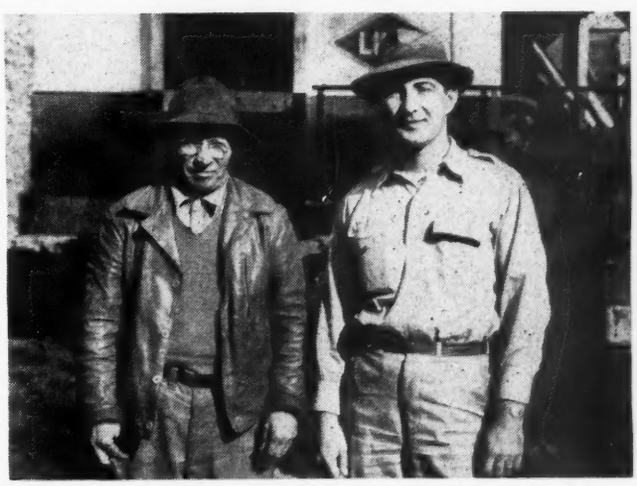
Haulage from the loading shovel to the tipple is contracted. The trucks are diesel-powered Mack end-dumping trucks with capacities of 2 cu.yd. and built-up bodies to carry 10 tons of coal. From the pit shown in the illustrations, the haul was 2½ miles. This strip mine was opened in February, 1946, and, to date, the maximum haul has been four miles. About five miles of crop line has been stripped and there remains about the same amount to complete the job. The maximum truck haul will be seven miles. Approximately 150,000 tons of coal has been mined to date.

The tipple, which loads mine-run only, is at the end of a 12-mile line of the Nicholas, Fayette & Greenbrier Ry., extending up Clear Creek from Rupert and owned jointly by the C. & O. and the N. Y. Central.

Charles H. Lambur, New York City, director of mining operations, reports that future plans include enlarging the railway siding so as to double the shipped tonnage to 2,000 tons per day. An additional pit is to be opened and one piece of equipment, a new Lima 1201 High-Lift 2½-yd. shovel, has been put into operation since this article was prepared. Additional coal reserves also have been obtained, and M. Hilliard has been made general superintendent, replacing Mr. Quigley, who has gone into business for himself.

Here the stripping has been carried as deep into the hillside as the equipment will permit and the coal from the last cut has been loaded. The highwall is 48 ft. Three cuts have been made and the width of coal recovered was 160 ft.

When these protective stringer beads of manganese steel are worn off, it is time to reface the tooth and add new stringers.



John Farkas (left), pit superintendent, and K. M. Quigley, general superintendent of the Clearco strip operation.

HAULAGE

For Efficiency With Conveyor Mining

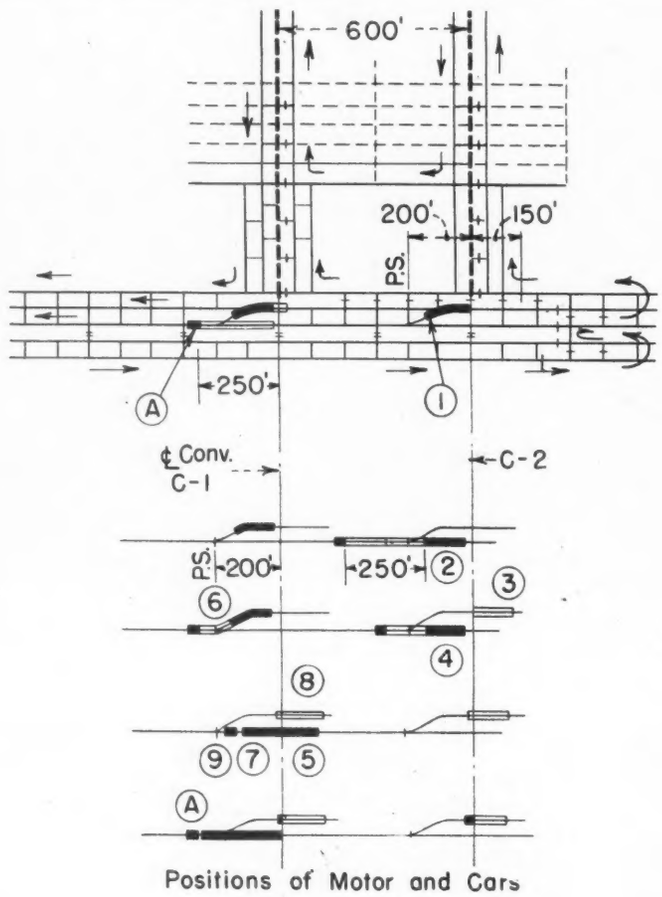
Double-Ended Sidings at Conveyor Loading Points Compared to Stub Sidings — How Runarounds Operate as Alternatives — Combination Siding and Straight-Track Loading—Shafts Between Seams

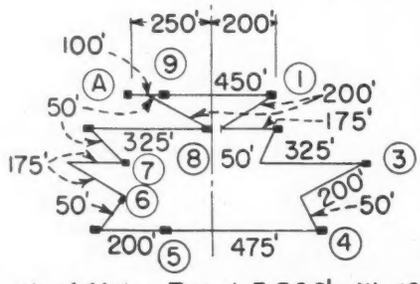
By J. H. DICKERSON
Consulting Engineer, Huntington, W. Va.

CONVEYOR sections frequently are found where 200 to 300 tons per shift is loaded into mine cars on stub sidings. As compared to operation with sidings connected at both ends, this practice tends to increase the cost of conveyor mining. In the following, the writer will attempt to indicate the savings made possible by concentrating conveyor sections, increasing the tonnage at loading points, shortening motor hauls and reducing switching time by providing loading sidings connected at both ends.

Two adjacent loading points with stub sidings are shown in Fig. 1. Belt conveyors bring the coal to the mine cars. It may be put onto the belt by hand-loaded chain and face conveyors or by shakers, duckbills, scrapers or other types of loaders or conveyors. Where the seam is low and the coal is cleaned in the mine and loaded by hand onto conveyors, 400 tons per shift will be a good tonnage for the belt. However, more may be loaded under favorable conditions with mechanical-loading equipment. Our first study is based on 400 tons per shift for each belt conveyor, with two car loaders and one motor crew serving both.

The positions of the motor and cars during the switching period is shown in Fig. 1. The starting point is *A*, with the motor pushing 20 empties— 5 tons each—with a total length of 250 ft. At Point *1*, 10 loads are coupled to the empties





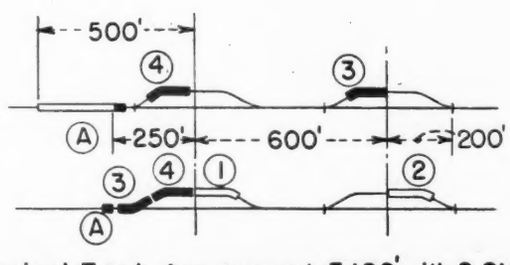


Fig. 1—Plan of operation and factors involved in car service to conveyors with two loading points and stub sidings.

and are pulled out to the main track and left at Point *2*. The motor then clears the switch and places 10 empties at Point *3*. It then goes back and couples to the loads at Point *4*. This completes the changing of cars for Conveyor *C-2*.

The motor then moves toward Conveyor *C-1* and leaves 10 loads at Point *5*. Then, loads are picked up at Point *6* and placed at Point *7*, where they are coupled to the loads at Point *5*. The motor then places empties at Point *8* and returns to Point *9* to get the 20 loaded cars. As it moves past *A*, the cycle is completed and the motor pulls the trip to the tipple.

At times, the motor moves alone. At others, it has 10, 20 or 30 cars. Consequently, the movement of the motor does not keep it the same distance from Conveyor *C-1*. The motor will not always stop at a point just clearing a trip at a switch and the distance that empties and loads must be moved will vary. However, the total of the distances shown is the approximate minimum the motor will travel in placing the empties and picking up the loads.

Stops Cut From 16 to 9

Sixteen stops are made for coupling, throwing switches, etc. To begin placing cars, the motor must stop to let the triprider walk around the empties to throw the switch twice and couple to the loads at Point *1*. Then, he has to uncouple loads at Point *2*, place empties at Point *3* and again couple to the loads at Point *4* to complete the change for Conveyor *C-2*. Next, the loads have to be left at Point *5* and the triprider has more walking, coupling and switches to throw (four times) to complete the change for Conveyor *C-1*.

With 16 stops in moving the motor 3,300 ft., it is hardly possible to average 300 f.p.m. At that latter speed, however, the time required would be 11 minutes and, allowing six minutes for the triprider for walking, throwing switches and coupling, the time necessary to change 20 empties for loads would be 17 minutes. If the loading points were farther apart, the conditions would be less favorable. If a runaround is not provided in the mine so that the motor can push the cars to the loading point, it is necessary to push them from the tipple. This is dangerous and, in addition, the motor will not make as good time as if it were pulling the empties.

If the track in the mine is unusually good and the grades fair, the main-line motor may average 6 m.p.h. pulling loads and empties. This, however, is exceptional. Some haulage motors are geared to run 8 m.p.h., but this seldom is considered safe, especially in an airway. High speed results in much dust and a wreck may block ventilation. If cars are pushed into the mine, the speed probably will be reduced at least 25 percent and, as noted, the practice is dangerous. With a runaround in the working section, the motor could pull the trip going in, but would require about three minutes to change ends at the runaround.

If the distance from Point *A* (Fig. 1) to the tipple is 1.7 miles and the motor averages 5.25 m.p.h. pushing empties and pulling loads, the running time for the round trip is 39 minutes. If six minutes is required at the tipple, the total for a round trip, including 17 minutes of switching time at the conveyors, is 62 minutes.

With the revised track arrange-

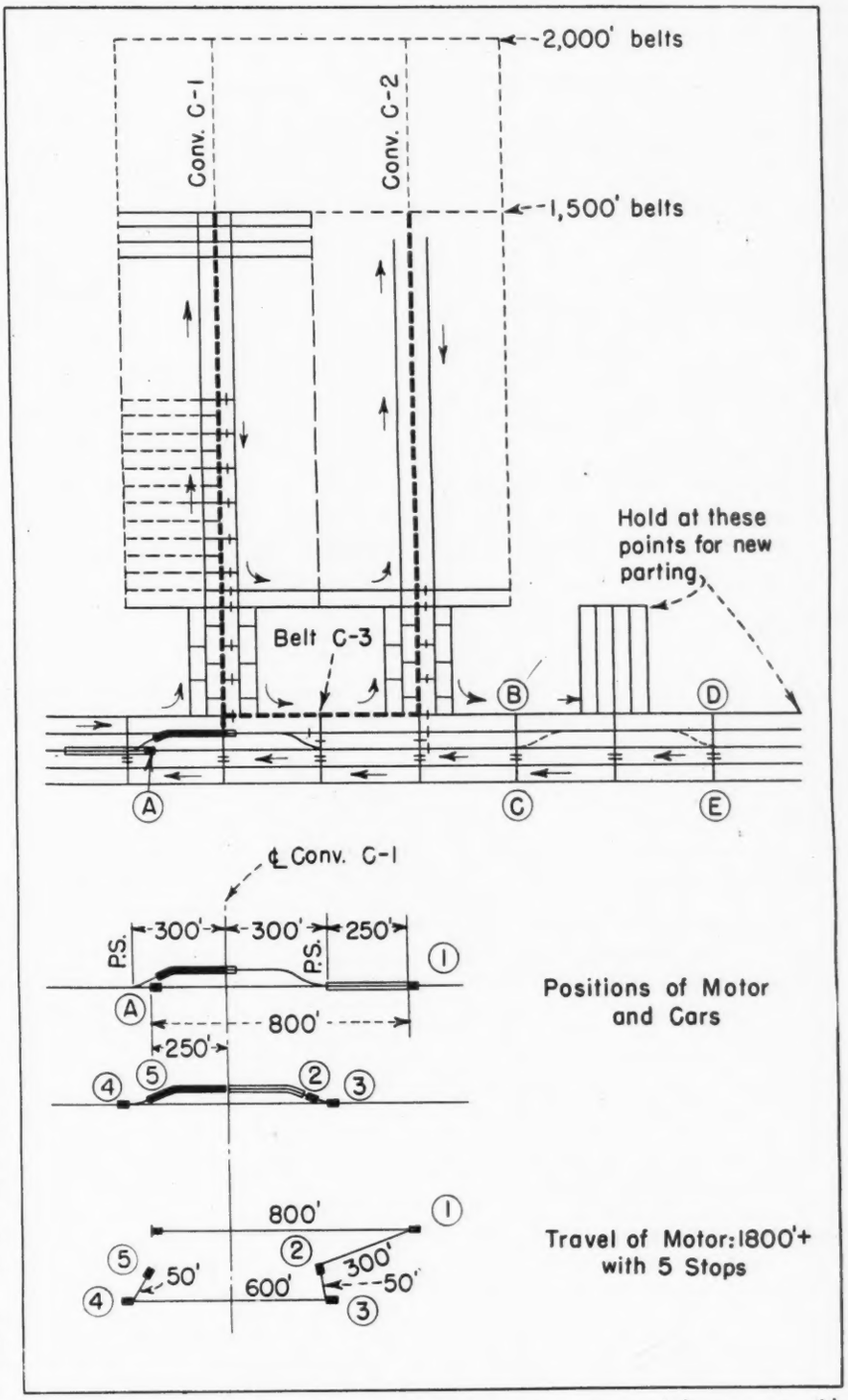


Fig. 2—Plan of operation and factors involved in car service to belt conveyors with auxiliary belt to bring all coal to one loading point on double-ended siding.

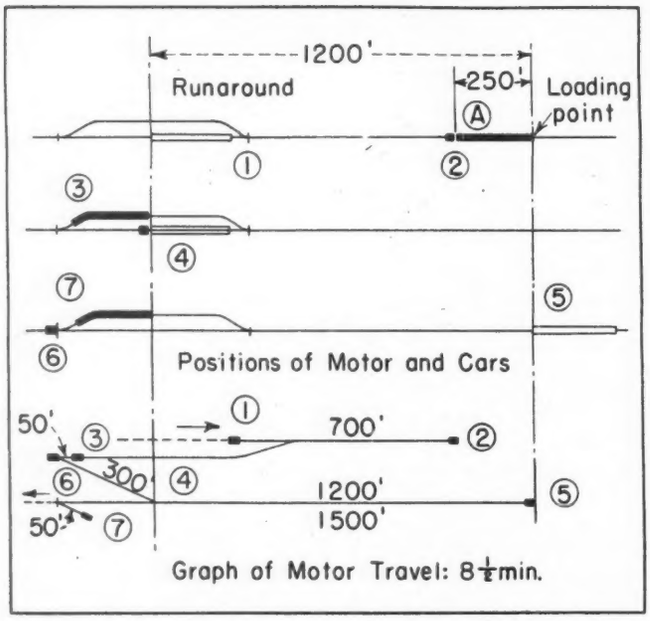


Fig. 3—Loading on a straight track with car service from runaround 1,200 ft. from conveyor.

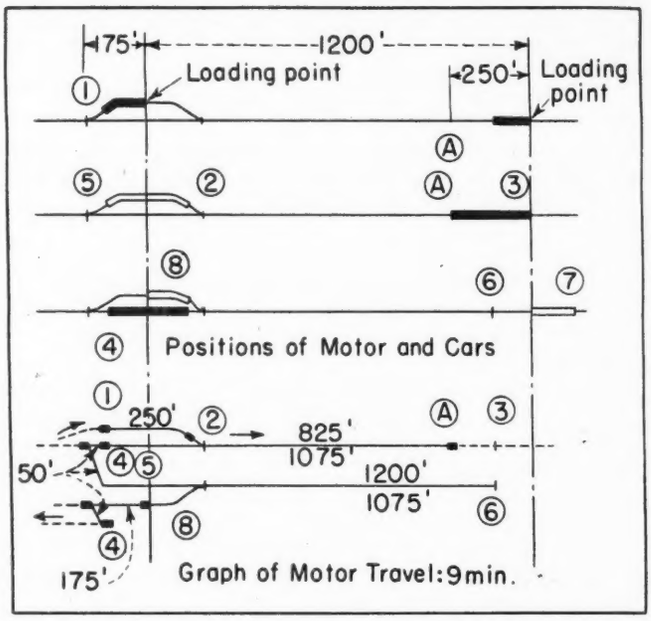


Fig. 4—Loading from two conveyors with short double-ended siding and straight track.

ment shown in Fig. 1, travel in changing trips at the conveyors is reduced to 3,100 ft. and the number of stops to nine. As the average distance between stops is about twice as long and the motor does not always have a load, it should average about one-third better time than in placing cars on stub sidings, reducing the travel time to eight minutes. The triprider would have very little walking to do and throwing of switches and coupling would be much easier. Therefore, only two minutes would be required for stops, making the total switching time 10 minutes. With the motor pulling the empties and loads on the main haul, the average running time could be calculated on the basis of 6 m.p.h., reducing the total for the round trip to 34 minutes. With six minutes at the tipple, the total, including changing cars at the conveyors, would be 50 minutes. Thus, by rearrangement of the tracks, the round-trip time would be reduced 12 minutes.

By connecting Conveyors *C-1* and *C-2* with an auxiliary belt, *C-3*, and loading coal from both room entries at one point, as shown in Fig. 2, one car loader can do the work of two and motor travel and switching time are reduced. Under this plan, the motor travel is about 1,800 ft. with five stops. The motor will be running light on one run over one-third the distance. The running time should not exceed 4½ minutes with 1½ minutes for stops. The times the triprider would have to stop the motor or trip to throw switches would be sharply reduced. Empties could be uncoupled by the motorman or loads coupled, so that the triprider would have little walking to do.

The running time on the main line, at 6 m.p.h., would be 34 minutes, plus six minutes each at the conveyor loading point and tipple, making the total for a round trip 46 minutes. One motor should be able to handle 160 cars with capacities of 5 tons in six hours and eight minutes, provided the motor, cars and track are in first-class condition and there is no time lost waiting on other motors or other delays. With two stub sidings, it would take one motor eight hours and 16 minutes to handle the same tonnage. The difference is two hours and eight minutes and one motor could not handle 800 tons a shift.

On the basis of actual working time, the cost of the motor and cars used, including power, depreciation and labor, may be assumed to be approximately $5 per hour. This would indicate a saving of about $11 per shift with the improved arrangement. If the original system of stub sidings required the use of two motors, with considerable time lost in waiting, the saving would be even greater.

Depreciation on a 600-ft. mine conveyor belt 30 in. wide may be taken at $100 per month. This would have to be charged against the saving in mine-car haulage and the pay for one car loader.

Another disadvantage of stub sidings is the necessity of pulling loads before empties can be placed. This may require stopping the belt conveyors as long as half an hour a shift, thus reducing the tonnage loaded. This seldom happens where the motor can maintain a schedule and place empties before pulling loads. The difference in costs for single-shift mines and a production of 800 tons per day from a section can be calculated approximately as follows:

One Loading Point

	Per Day
Wages, one car loader	$12
Belt depreciation	4
Placing belt, etc.	4
Total	$20

Two Loading Points With Stub Sidings

Wages, two car loaders	$24
Extra haulage cost	11
Extra track, etc.	4
Total	$39

The saving per day, with one-shift operation, consequently is $19.

A runaround near a loading point on straight track will save time as compared to a stub siding and the small saving in haulage provided by a loading siding connected at both ends may not justify its cost. For example, Fig. 3 shows a loading point 1,200 ft. ahead of the center point on a runaround. The haulage motor pulling empties leaves them at Point *1* and picks up loads at Point *2*, leaving them at Point *3*. The motor then pushes the empties at Point *4* to the loading point, *5*, runs light to Point *6* and couples to the loads at Point *7*, where it already is 1,200 ft. on its way to the tipple from the starting point, *A*, in Figs. 1 and 2.

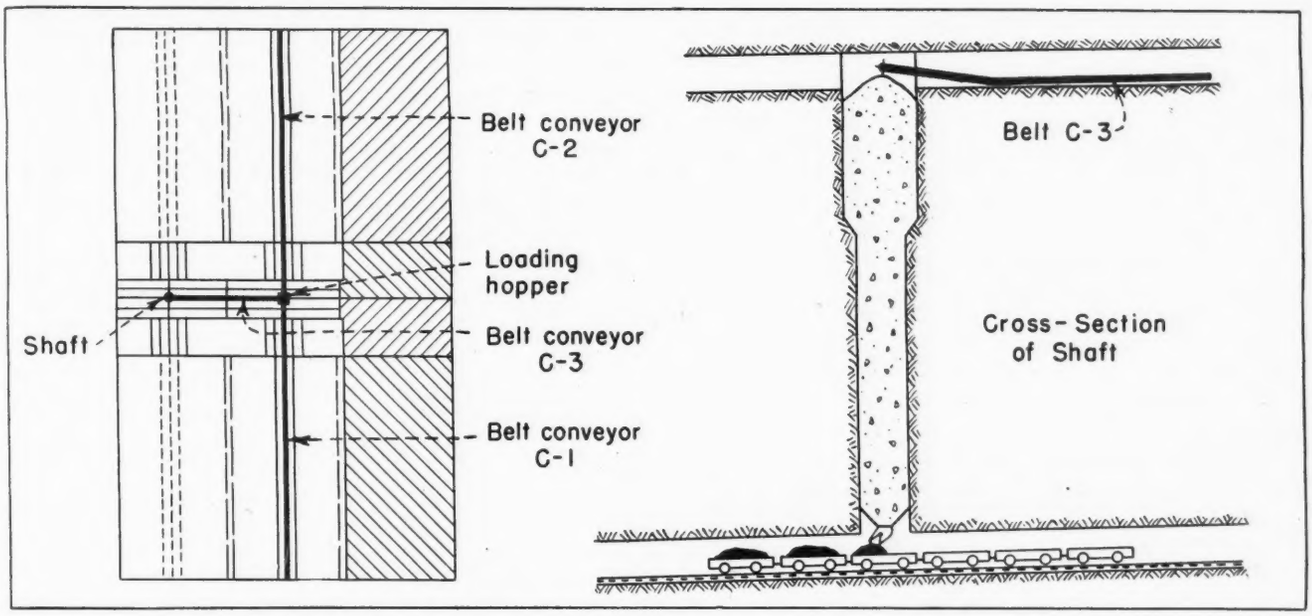


Fig. 5—Operation of upper seam by belt conveyor to shaft and haulage in the lower.

In the graph in Fig. 3 showing motor travel, it will be noted that the motor does not pass the loading point. In the plan shown in Fig. 2, however, it has to pull empties ahead to clear the switch before backing them to the loading point. In Fig. 3, the motorman or triprider uncouples empties at Point *1* and the other couples loads at Point *2*. The triprider throws the switch for loads going to Point *3*. An automatic switch permits the motor to leave the siding and go to empties at Point *4*. Empties are uncoupled at Point *5* and the switch must be thrown to get the motor to Point *7*. The triprider closes the switch and catches the end of the loaded trip going out.

The total travel is 5,000 ft. but 2,400 ft. is on the way in and out and must be deducted. Total time for switching may be taken as 8½ minutes, which is only 2½ minutes more than for the plan shown in Fig 2. If the distance between the center of the runaround and the loading point was only 600 ft., switching could be done in about the same time as in Fig. 2.

If the haul is short and it is desired to change cars more frequently at two loading points, a shorter siding may be used for the first and a straight track for the second (Fig. 4). The same plan may be employed in completing the first loading section, when the tonnage is low, or in night-shift operation with development tonnage only.

In Fig. 4, the motor pushes the loads ahead (Point *1*) and leaves empties at Point *2*. Then it pushes the loads ahead to pick up additional loads at Point *3*. The loads are pulled to Point *4* and the motor goes to the empties at Point *5*. These are pushed ahead and half of them are left at Point *7*. The others are brought back for loading at Point *8*. With the empties in place, the motor picks up the loads and leaves for the tipple. In the graph, the motor passes Point *A* as far as Point *6*. Its total travel is 4,750 ft. but 2,150 ft. is on the way in and out and is to be deducted. The time compared with work done in Fig. 3 should be about nine minutes.

Haul in Lower Seam

With two workable seams within 100 ft. of each other, it may be advisable to haul the coal on the lower level and draw from the upper seam through a shaft receiving the product from a conveyor system in the upper seam. Years ago, before conveyor haulage was used in mines, the fuel mines of the Norfolk & Western Ry. Co. had workable seams about 80 ft. apart and connected them with six shafts. Coal was dumped into these from mine cars and was reloaded into mine cars at the bottom through chutes with undercut gates. Cars were loaded from the shafts by the motor crews with the cars in continuous motion and with very little spillage.

Today, coal is transferred from a large bin to mine cars at a rate of 20 tons per minute. There are two undercut gates operated by the triprider with the cars in motion. This not only saves the wages of a car loader but also time for the motor crew, as cars can be loaded in less time than is required to place empties and pick up loads. It also results in a faster car turnover, as they are in use continuously rather than about half the time.

At this operation, a feeder draws coal from a shaft to a conveyor, which takes it to the headhouse (*Coal Age*, December, 1942). No special attempt is made to keep bins or shaft full to reduce breakage, as the coal is quite hard and most of it is crushed at the tipple, and the difference in breakage between coal from this source and that coming to the shaft or headhouse by mine cars is hardly noticeable.

Fig. 5 shows a belt conveyor, *C-3*, delivering coal to a shaft from Panel Belts *C-1* and *C-2*. The hatched sections show two room panels and also main-entry pillars, which are recovered on the same plan. Conveyors for the room panels were moved to the location shown and Conveyor *C-3* was shortened. The panel conveyors may be 1,500 to 2,000 ft. or more in length. A conveyor 3,500 ft. long was installed in one mine but this length would have been excessive had not the grade been in favor of the load. The room entries comprise three headings, with 300-ft. rooms on each side, as shown in other figures. A strip about 40 ft. wide is shown between the panels. This frequently is desirable. The work shown may be extended as far as desired by conveyors or new shafts.

Fig. 5 also includes a section showing, in cross-section, how Belt Conveyor *C-3* discharges to the shaft. Shafts may be raised from

the bottom or sunk from the top. In this case, the upper part is shown enlarged to increase the storage capacity. This may be done after the two seams are connected and the excavated material dropped to the lower level. If breakage is much of a factor, it may be desirable to have a large part of the tonnage in the upper section and also to have coal left in the shaft at all times. The coal will not freeze, as in outside bins. For more rapid loading, two gates may be used at the bottom.

Ventilating 3-Heading Entries

With three-heading entries and a belt conveyor in the center, the air may circulate in either direction. However, it should move the same in the center and on one side. This will decrease the velocity of the air along the belt, reduce dust, etc. In Fig. 2, air is shown entering the first room entry from the intake entries, one of which is used as the haulway. In Fig. 1, the haulway is one of three returns after the air has gone to the face of the mains and ventilated the room entries. Belt *C-2* must pass through a temporary stopping. This should be reasonably tight, as the loss where conveyors pass through stoppings will be 1,000 to 2,000 c.f.m. per square foot of opening. The quantity will depend upon the open area and the pressure, which should be less than ½-in. w.g. for the workings as shown. The leakage in the stopping for Conveyor *C-3* in Fig. 2 probably will be around 1,500 c.f.m. per square foot of opening, but it will unite with air going to Conveyor *C-2*, where it will be of value. There will be no stopping for Conveyor C-1, which is a better arrangement than shown in Fig. 1.

In Fig. 6, three curtains and a filler are suggested where belt conveyors pass through temporary stoppings. The curtains may be made from old inner tubes or material used for powder bags. The first curtain should clear most of the material traveling on the belt. The second should come down on the sides and be cut to clear average loading on the belt. The third should clear the empty belt about 2 in. and is held up by the coal when the conveyor is loaded. The curtains will swing in opposite directions when the conveyor is reversed to move posts, etc. One company using an extra long belt at an unusually high speed had a rather high water-gage at a conveyor curtain. With their fine coal, there was so much dust they put in a sprinkler, but this seldom should be necessary. In an all-conveyor mine, curtains can be avoided along the main-haulage belt.

A set-up based on a belt conveyor 1,800 ft. long with rooms 300 ft. deep on each side in 42-in. coal should produce about 100,000 tons. Thus, the total for Conveyors *C-1* and *C-2* in Fig. 2 would be 200,000 tons. Conveyor *C-2* may be 26 in. wide for ordinary loading, but with mechanical loading, Conveyor *C-1* should be 30 in. wide because it handles coal from two panels and with peaks there otherwise would be some spillage. The cost of the conveyor would be increased about $1 per foot of length. At 250 f.p.m., the conveyor would be good for about 175 tons or more per hour. It is best, however, to have all conveyors the same width to facilitate interchange of parts. It may be desirable to have a separate short belt operating at a higher speed to transfer the outputs of Conveyors *C-1* and *C-3* (Fig. 2) to the cars. The car loader may stop Conveyors *C-2* and *C-3* if he notes spillage.

Timing Conveyor Set-ups

Conveyor *C-1* (Fig. 2) should be started at least a month ahead of Conveyor *C-2*. Before the full length is required, part may be used to extend Conveyor *C-3* as far as Point *B*. A chain conveyor may be used from Point *C* to Point *B*, with shaker-conveyor loaders to extend the headings another 300 ft. Later, as Conveyor *C-1* is shortened in retreating, Conveyor *C-3* may be extended to Point *D*, after which the next room entries and then the mains are driven to the limits shown in Fig. 2. Work should be concentrated in the section served by Conveyor *C-2* so that it will finish within a month after the territory served by Conveyor *C-1*. An extra drive and terminals for a 30-in. belt may be desirable. With it, another 800-ton loading section could be started when the time came to start reducing the length of Conveyor *C-2*, sections could be interchanged and two full lengths of conveyor would not be required. Use of conveyors should be carefully scheduled.

Conveyor *C-3* (Fig. 2) might be extended to handle coal from two or more room entries. Three would require an 1,800-ft. belt and would bring coal from four room sections to the same loading point. This would require an additional 1,200 ft. of 30-in. belt conveyor and an extra drive and terminals to work two entries at a time after completion of the territory served by Conveyor *C-1*. Then, it might take longer to finish such a section at lower-than-maximum tonnage, but it may be possible to correct this by reversing Conveyor *C-3* to a new loading point ahead to finish the last room entry.

The saving as between the plan with one loading point and the other with two with stub sidings may be calculated roughly on a tonnage basis as follows:

One Loading Point (Fig. 2)

	Per Ton
Wages of car loader.....	$0.015
Extra for belt depreciation.	0.005
Placing belt, etc.....	0.005
Total	$0.025

Two Loading Points (Fig. 1)

Wages of two car loaders...	$0.030
Extra motor time.....	0.014
Extra track.....	0.005
Total	$0.049

For three sections, the indicated saving therefore would be about $60 for a one-shift day with a 2,500-ton output. This analysis does not cover all the factors, but it is not likely that more definite data and more careful study would greatly increase or decrease the figures for the factors mentioned and conditions assumed. The main point is that there is a substantial saving by this improvement in haulage and that further savings may be made by other careful planning.

A rough comparison between two and four room-entry panels would reduce the average motor haul for the latter by 600 ft., or nearly a fourth of a mile for the round trip, and save preparation of a new loading point, but would increase belt depreciation. The expense of the loading point will include track, shooting some top on the loading side, some extra timbering and so on, and may be taken as $2,500 for the siding without the main-line track. There would be some saving in ventilation and a shorter motor haul, but the plan would hardly be as economical as two room panels, unless there were to be no workings ahead and 1,200 ft. of haulage track could be saved. The choice must be made on the basis of calculations for the conditions existing at the mine. With time study and the advice of an engineer who has made a special study of all forms of mechanical loading, methods of working, haulage, ventilation and coal preparation, costs may be kept at a minimum.

SAFER MINING

Achieved by Strong N. W. I. Program

Organization, Use of All Accepted Safety Measures and Training in First-Aid and Rescue Work Get Results at N. W. I. — "Bazooka" Duster and Underground Air Receiver Among Late Developments

By WARREN E. CRANE
Seattle, Wash.

SAFETY FIRST really is the keynote in the operations of the Northwestern Improvement Co., a subsidiary of the Northern Pacific Ry. Co. N. W. I. operates four mines in Washington, producing about 40 percent of the coal mined in the state. In addition, Foley Bros. Inc., operates for N. W. I. the biggest strip mine in the West at Colstrip, Mont. In spite of the added difficulties involved in mining on pitches —the general condition in Washington—the N. W. I. campaign has resulted in a marked reduction in the number of fatalities and injuries among its employees.

The Northwestern Improvement Co. began operation at Red Lodge, Mont., in 1882 and at Roslyn, Wash., in 1886. During its earlier history in Washington the company suffered from three explosions—one at No. 1 mine, Roslyn, in 1892, claiming 45 lives; one at No. 4, also at Roslyn, in 1909, resulting in 21 deaths; and one at Ravensdale, in 1915, claiming 31 lives. These catastrophes put the company on its mettle and moved it to concentrate on ways of preventing a recurrence of these major disasters. Its history during the past 20 years consequently has been characterized by a determined fight to eliminate as many mishaps as possible. As a result, the organization has cut down fatalities in its Washington mines to an average of less than two a year during the past 20 years, in spite of the difficulties inherent in prevailing natural conditions.

Earl R. McMillan, assistant manager of mine operation and chief engineer, points out that the company has kept track of its production and fatalities in Washington for nearly 60 years, and the record shown in Table I illustrates how it has carried on a winning fight to reduce casualties.

During 1946 the company suffered two fatalities with an approximate coal production of 392,370 tons. As a result of its safety campaign and the installation of various safety devices, the company during the past 20 years has been awarded some twelve or more certificates of merit by the Joseph A. Holmes Safety Association. Its life-saving teams have won first place in international mine-rescue contests and the highest honors some years ago in a combination first-aid and mine-rescue contest held in Butte, Mont. In addition, it has won a plaque as well as 13 cups for outstanding achievements in safe mining.

How was reduction of fatalities accomplished? It has been a long and difficult process. In 1933 it seemed to company management that the state legislature was trying to put the organization out of business by legislating electrical equipment out of its mines. However, by converting all of its underground electrical equipment to conform to U. S. Bureau of Mines standards for safe use in gaseous mines, and with federal court protection, the company was able to continue operation of its mines and finally remove this opposition.

The company has carried on a steady campaign for the introduction of more accident-prevention measures than required and has made it a policy to follow to the letter all safety regulations required by government authorities. Under the full-time supervision of Frank Badda, company safety engineer, they have also cooperated with the U. S. Bureau of Mines, carrying on an intensified and systematic training of their employees in mine rescue work and first-aid

Three Holmes awards and numerous honors for mine rescue and first aid have marked progress in safety at mines of the Northwestern Improvement Co. This illustration shows the team that carried off highest honors in both rescue and first aid in 1928. Left to right, rear row, are: Wilson Clark, Jack McSherry, Thomas Murphy (now manager for N. W. I.), Bob Bell, Clarence Anderson (deceased) and Clarence Holmes; front row, Claude Webber, Tom McKean, William Saul and Herbert Newman (deceased).

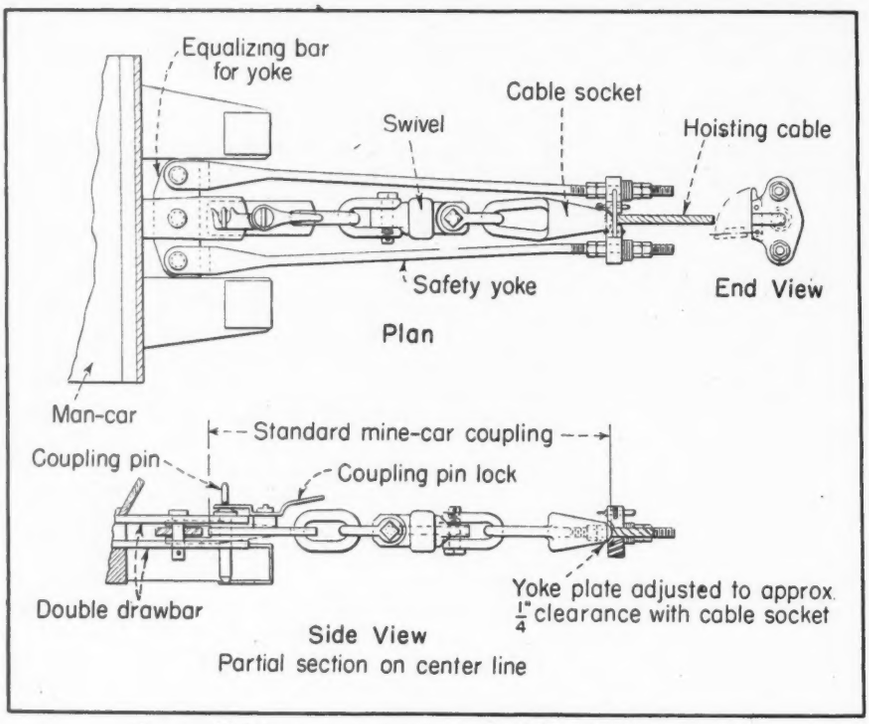


Fig. 1.—Hoisting-rope connection and safety yoke for man-cars.

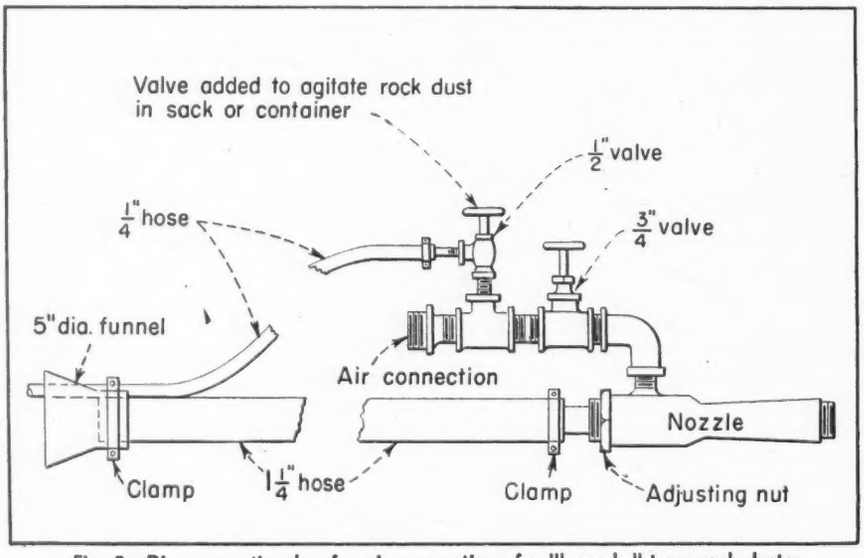


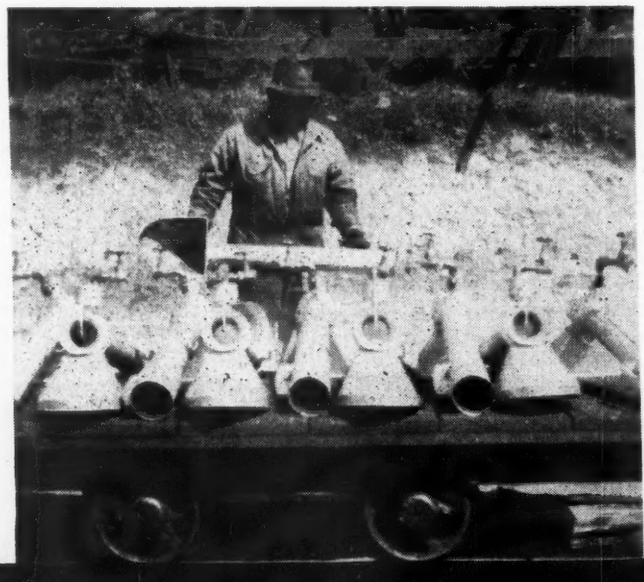
Fig. 2—Diagrammatic plan for air connections for "bazooka"-type rock duster.

Table I—Production and Fatalities, Washington State Mines of the Northwestern Improvement Co.

Year	Production	Fatalities
1887	39,531	..
1888	157,376	..
1889	186,675	..
1890	372,342	..
1891	410,951	..
1892	262,328	53[1]
1893	308,535	1
1894	177,945	1
1895	283,380	..
1896	230,476	2
1897	272,168	1
1898	482,685	1
1899	592,246	2
1900	791,099	4
1901	921,589	6
1902	1,106,018	7
1903	1,328,580	7
1904	1,325,713	3
1905	1,237,593	7
1906	1,452,692	9
1907	1,389,946	11
1908	1,336,564	15
1909	1,376,300	21[2]
1910	1,333,151	7
1911	1,099,006	11
1912	915,635	4
1913	884,049	5
1914	973,042	2
1915	600,289	35[3]
1916	1,325,944	5
1917	1,181,194	6
1918	1,196,244	6
1919	914,168	2
1920	1,369,546	2
1921	1,188,114	3
1922	866,182	2
1923	1,119,102	..
1924	809,757	6
1925	657,356	5
1926	894,864	4
1927	1,036,272	7
1928	957,925	5
1929	955,084	3
1930	831,251	2
1931	676,022	..
1932	593,134	5
1933	400,958	1
1934	486,970	..
1935	509,178	1
1936	602,030	2
1937	702,124	2
1938	550,680	2
1939	615,297	1
1940	654,835	2
1941	797,000	..
1942	768,100	2
1943	543,194	..
1944	554,358	..
1945	531,306	..
1946	392,370	2
Totals	46,549,663	293

[1]Explosion, Roslyn No. 1, 45 deaths.
[2]Explosion, Roslyn No. 4, 21 deaths.
[3]Explosion, Ravensdale, 31 deaths.

Left is an early-model "bazooka" under demonstration; right is a number of late-model units ready for service.



and have done everything possible to make them safety-conscious. A one-story building at Roslyn, where the company's three largest mines are located, is devoted exclusively to the training of employees in mine-rescue work and first-aid.

In accordance with state mining law N. W. I. holds regular safety committee meetings. This group is composed of both company officials and miners. They go over the accident records of the past month and study each mishap and discuss ways and means of preventing similar ones from recurring in the future.

A special safety device (Fig. 1) has been developed by the company for use on man-cars to prevent runaways on slopes in the event of the failure of couplings between the man-car and the hoisting cable. Such failures have occurred in other mines of the country and have resulted in serious accidents. This device is inexpensive and made by the company in its own shop. It consists of two round steel bars 1 in. in diameter, fastened at one end to the bumper of the car and at the other to a yoke that fits loosely around the rope. In the event of the failure of any part of the coupling, the rope socket is held by the yoke, which takes over the load released by the failure of the coupling.

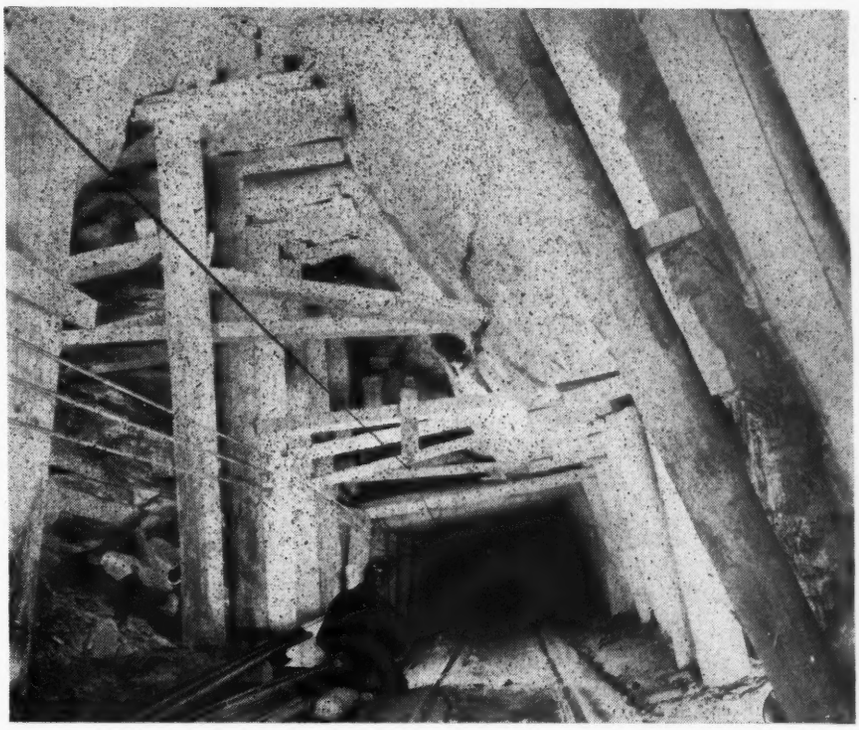
Careful Timbering Stressed

The company also exercises great care in timbering. Some of its work along this line is shown in an accompanying illustration. The timbers are set in neat rows and are placed at just the right distance apart to safely carry the weight. This pattern is set according to a definite plan which is determined in turn by the structure of the roof and the intensity of roof pressure.

Another accident preventive the company has installed is a rock-dusting device, popularly known as a "bazooka," used to spread rock dust on all surfaces and timber in the mine. This apparatus is used in all tight places in which the regular track-mounted rock-dusting machines cannot conveniently operate. It is manufactured in the N. W. I. plant at Roslyn. The machine uses compressed air to shoot the dust into ont-of-the-way nooks and crannies in the mine.

Miners are required to wear hard hats and safety shoes. Electric cap lamps are used and matches are prohibited underground. Miners are cautioned against riding in cars

Mining with shaker conveyors on the pitch in Roslyn No. 5 mine. Note guard on right side of machine to protect drums.



Systematic timbering with ample support is the rule at N. W. I. mines. The illustration above shows timbering on a gangway where intersection with an old opening resulted in a heavy cave. Below is timbering placed at the face before the coal was shot.

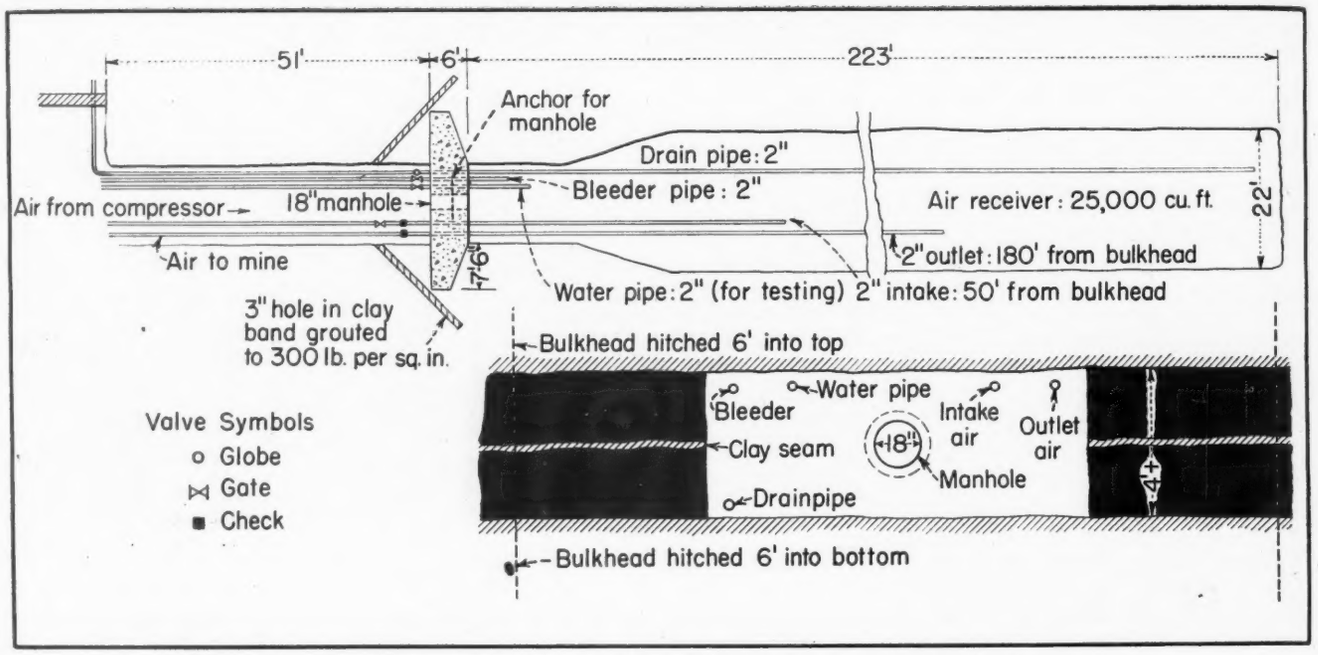


Fig. 3—Layout of underground air receiver made in a blind room at Roslyn No. 3 mine.

with their arms or legs hanging outside. They are also warned not to lift objects that are too heavy for them and to avoid contact with trolley wires on haulageways. In addition to this, they are instructed to report immediately on all signs of gathering gas or possibilities of slides or falling rock. Mr. McMillan states that the company wishes that it were possible to use air-driven machinery exclusively in its various operations, because it believes the explosion hazard would be reduced to a minimum if this could be accomplished.

Receiver Equalizes Air Load

As a part of its efforts to operate a safer and more efficient mine, the company has utilized a blind room as an underground air receiver in Mine No. 3 at Roslyn (Fig. 3). This installation was made under the direction of Thomas Murphy, then superintendent and now general manager of the company's three mines in that community. In making this improvement he followed the example of Charles Pengilly, an executive of the Tebekwe Mine, Homestake Gold Mining Co., Selukwe, South Rhodesia, Africa. The aim in this installation was to avoid installation of larger compressors to take care of an impending increase in drilling operations and to improve the air circulation in the mine. The chamber for the installation was excavated in the coal seam itself. The capacity is 25,000 cu.ft. since the dimensions are: length, 300 ft.; width, 20 ft.; height, 4 ft. plus. It has been in operation over four years since its installation in 1942 and has proved very beneficial in its results.

When this improvement was undertaken, air was being supplied by two compressors, an Ingersoll-Rand Type XRB-2 unit with a capacity of 290 c.f.m. and a smaller single-stage unit with a capacity of 115 c.f.m., which had been set up in an underground station 1,200 ft. above sea level. The bigger machine was acquired in 1936 to furnish power for drills employed in driving some tunnels and the smaller one was added later.

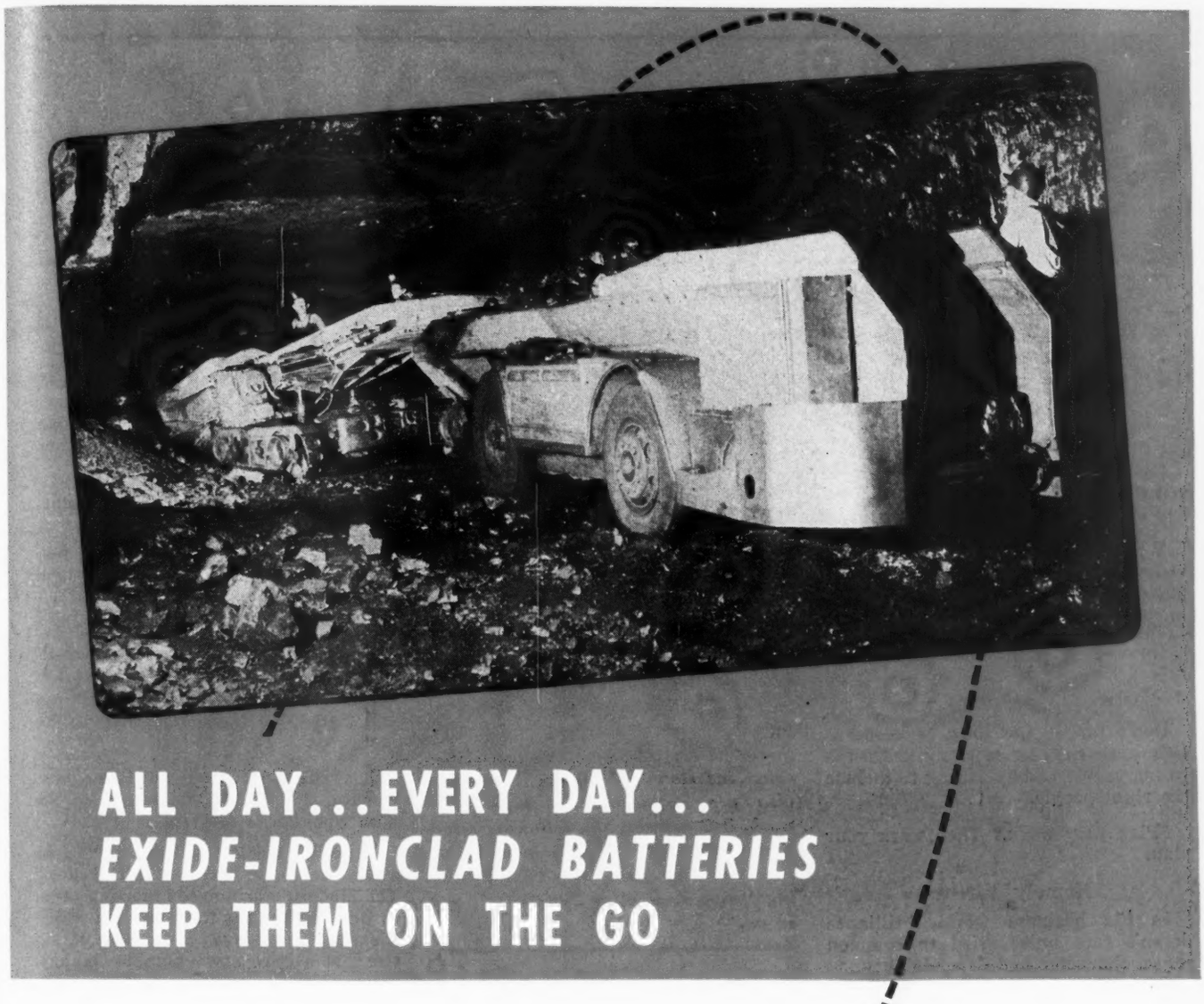
After tunneling had been finished, air-operated drills were tried out and proved to be so successful that they were adopted generally. At the time the new underground air receiver was installed, 20 Ingersoll-Rand Size CS auger drills were utilized for drilling coal and five JA-35 "Jackhammers" for drilling top and bottom rock in entries. When all of these machines were operating at the same time they required more air than the two compressors could possibly furnish. It was only because the drilling was intermittent that the compressors were able to maintain even approximately effective pressure in the lines. Occasionally, the drills would "gang up" and the air pressure would drop lower than the effective level. At other periods, when most or all of the drills in the mine were idle, the compressors would rapidly build up full pressure in the three 175-cu.ft. steel tank receivers and in the 20,000-odd feet of 2-in. air-distribution lines Then the compressors would idle along until more drills were started and began to cut the pressure down.

At the time of the installation of the receiver, the mine was operating at full capacity on one seven-hour shift and at about 25-percent capacity on a second shift devoted to development work. It became obvious that with adequate storage capacity for compressed air it would be possible to run the compressors at a 100-percent load factor during the whole 24-hour day, if necessary. Inasmuch as they operated unloaded part of the time during even the main day shift, there probably would be no need for running them much beyond the actual duration of the working shifts.

One Compressor Eliminated

The building of the large receiver has made it possible for the company to discontinue the use of its smaller compressor and move it into another of its mines where it was sorely needed. In addition, the remaining 290-c.f.m. compressor has been able to run at a better load factor.

The foregoing safety steps by the company in its various fields of operation have borne fruit in a diminishing injury and fatality list that has been a source of great satisfaction to the company and its employees and has demonstrated that their efforts to promote accident prevention have not been in vain.



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Exide-Ironclad Batteries have the *high power ability* that frequent stop-and-go service demands ... a *high maintained voltage* throughout discharge ... the *high capacity* needed to assure peak performance ... plus the dependability, long-life and ease of maintenance which mining service requires.

If you have a special battery problem, or wish more detailed information, write for booklet Form 1982.

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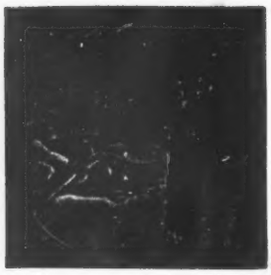

The Foremen's Forum

Foundations for Better Supervision: New Proverbs for Bosses

Because of their aptness, which is being reflected in wide reproduction in McGraw-Hill publications and elsewhere,* Coal Age *offers the following proverbs in the belief that supervisors will find them helpful in their daily work. Developed by Philip W. Swain, editor of* Power, *a McGraw-Hill publication, they originally were offered by him as "New Proverbs for Young Engineers." All except those indicated by an asterisk (*) are offered by Mr. Swain as his own brain children. Because, as stated,* Coal Age *feels they also are applicable in supervisory work, it is printing the following selection, with Mr. Swain's permission, modified where necessary by substituting "supervisor" for "engineer" and so on.

Business Tips

Learn early how to meet people, sell things, handle tools, do the everyday chores of business.

Whatever his title, every supervisor must be a salesman to get people to adopt his ideas and cooperate in the completion of his projects.

However menial they may be, your first assignments will show the boss what stuff you are made of.

Don't tangle the lines of corporation authority by working with the wrong people and by failing to include the right people.

*Plan your work. Then work your plan.

Homely Virtues

In the business world, brilliance doesn't rate unless tied to common sense, character and dependability.

To go places in an organization, be known as the man who does what he said he would do and gets it done on time.

The ability to see the obvious is a rare and valuable talent, commanding a high price.

So many silly things are done in business that merely not being silly is almost a formula for success.

Getting-Along Skills

To succeed, a supervisor must learn how to get along with the man above, the man alongside, the man below and with his own self.

Self management is one of the most difficult arts and one of the most important.

If you can't get along with a few people it may be their fault. If you can't get along with many it's always your own fault.

Social-business tips: Try to remember names and faces. Get interested in the other fellow's hobby and children. Never underestimate the importance of the little friendly touch.

Average technical ability multiplied through cooperative effort accomplishes more than great talent working alone.

You'll never meet a man who isn't smarter than you in some respect. Why not admit it?

To make a man your friend ask his advice sincerely.

In petty squabbles, jealousies and gossip the innocent bystander may get hurt. Stand back.

The most common and important bossing operations in supervision are talking and writing.

Other things being equal, skill with words will add between $20,000 and $100,000 to a supervisor's lifetime earnings.

The supervisor who is a warm, expressive human being will always stand out in the crowd of overly modest and tongue-tied technologists.

There is neither sense nor profit in talking over people's heads. Plain talk is best, however profound the thought.

When small ideas in big words fail try big ideas in small words.

If you would command attention, understanding and action, write and speak plainly in short words and short sentences.

To learn how to make a good speech attend a typical engineering-society meeting. Note just how papers are presented. Then go thou and do otherwise.

Climbing the Executive Ladder

Number one requirements for any executive is an understanding of people and the ability to select them, direct them and win their loyal cooperation.

Let the man below do everything he can do as well as you at lower salary cost. And remember that power and credit must go with responsibility.

Both fairness and good business demand that you work always for the man who works for you.

Despite the old adage, don't be afraid to be a "jack of all trades." The modern world needs more of them to tie together the little cells in which the specialists live. Practical versatility is a rare and valuable quality.

In general, a man is made an executive not because he is outstanding in any respect but because the other candidates are badly lacking in some essential quality.

For success in cooperative ventures associate yourself with men who have the habit of success in all they undertake.

*Be polite to all the people you meet as you climb the ladder of success. You may pass some of them again on the way down.

No man will go far who can't perform the impossible now and then when occasion requires.

If your abilities are not appreciated, don't sulk; get another job. This is a free country.

Men are promoted not as a reward for past performance, but in expectation of future performance. Your past work is a sample, not an I.O.U.

Don't expect high position if you lack the courage to stand on your own feet, take full responsibility, make firm decisions and face the consequences without flinching.

Getting Started

The young or new supervisor should not try to impress his fellow

MINE LUBRICANTS

MARATHON

LOADER COMPOUND

KEEP THOSE CLUTCH PLATES FROM BURNING AND WARPING

Use Marathon Loader Compound to keep loaders on the job at *top capacity*

Your mines are mechanized for *production*. You've chosen your loaders on capacity... on ability to *load more coal*. Yet when a loader is out of service due to burned or warped clutch plates, production goes down.

You can get rid of that production threat as simply as hundreds of America's leading mines have. Use Marathon Loader Compound... the special lubricant designed to keep clutch plates from warping and burning up. Marathon Loader Compound reduces carbon deposits on the clutch plates that cause them to slip, then burn and warp. Marathon Loader Compound maintains its "body" at operating temperatures, providing good lubrication to gears and bearings and also reduces leakage to a minimum.

For more loader time in the room and less in the shop... make the switch to Marathon. An Ohio Oil Company Mine Lubrication Engineer will be glad to give you full facts. Just write, wire or phone.

A COMPLETE LINE OF MARATHON LUBRICANTS FOR EVERY OPERATION IN YOUR STRIP OR SHAFT MINE

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workers with the extent of his knowledge. The truth will leak out soon enough.

Never assume that something will get done just because you arranged to have it done. If the matter is important check, recheck and then check again.

If the facts of business life don't seem to jibe with the theories you have learned, stop and think before you deny the facts.

Because the accuracy and judgment of the young or new supervisor are suspect until proved, check and double check your every proposal and report.

Probably the best advice to the man just starting out as a supervisor is to make himself generally agreeable, useful and dependable without bootlicking and never, under any circumstances, "high-hat" anybody.

To insure success pick the right boss and proceed to make his life easy.

For the Good Life

Pick the right wife and learn how to get along with her.

For a full and happy life watch your health, keep peace with your neighbors and your conscience, be a good citizen, do some physical work at home, have some fun, too, cultivate a sport or a hobby, sample the best in the fine arts.

•

Mining Machines Need Skill and Care

By D. L. MORAN

Superintendent of Shops

Red Jacket Coal Corp., Red Jacket, W. Va.

To enable the operator of coal-cutting equipment to become better acquainted with the equipment he operates and to make himself a better operator, he should try to familiarize himself with the particular type of machine he operates. In this, the following should be of assistance.

In connection with operation of controllers, clutches of various types are utilized to connect cutter-chain sprockets and other parts and thus permit the machine to perform its duties. The motor should always be still or rotating no more than slowly when jaw-type clutches are engaged. Throwing in clutches with the motor operating at excessive speed will put undue strain on various parts and will cause serious damage.

Feed and handling drums usually are controlled by multiple-disk-type clutches. Hand wheels are provided which, when turned, press the disks in a disk clutch together, causing the feed and handling drums to revolve. With the jaw-clutch planetary-type feed-and-handling drums, friction bands are used to cause the drums to revolve. Oiling charts should be checked for the proper instructions as to how these clutches should be lubricated to work freely.

The cutter bar may work up or down in the coal as a result of dull bits. For instance, if the bottom bits are dull or broken off, the cutter bar will work up, and if the top bits are damaged, it will work down.

Special care should be taken to keep the cutter chain properly adjusted—and it requires some experience to judge whether the chain has the right tension. If the chain is too tight, the machine will take too much power, will heat the bearings in the vertical shaft and also heat the cutter head. On the other hand, if the chain is too loose, it is likely to get out of the guides and break.

One good way of testing the chain is to put the hand through the hole in the bottom pan on the right side of the machine where the cuttings are thrown out, take hold of the bit and pull. The chain should not move away from the back guide more than ½ in. If looser, tighten up the chain. If it does not move away from the back guide, it should be loosened slightly. Before tightening the chain, be sure to lift the lock that keeps the adjusting screw from turning.

When lugs are replaced in the cutter chain, care should be taken to make sure that the same kind of a lug is put in as was taken out; if not, the arrangement of the bits will be changed. The chain is built up with the lugs in definite relation to each other so that each bit cuts as much as any other. If the wrong lug is put in, in case of replacement, this arrangement is spoiled and some bits will cut more than others, causing undue strain and heating of the motor.

Where feed and handling ropes are concerned, watch for kinks. Do not put a strain on a rope with kinks in it. Do not try to force kinked rope through the sheave wheels and guards as this will cut the rope.

Beaking of ropes often is caused by bits not cutting enough clearance for the cutter head as a result of dull bits, incorrectly shaped bits or worn-out chain and rope guides. Ropes also are often broken by swinging the machine around too far when gripping the rib in finishing a cut. If the two ropes come too nearly in line, there is danger of breakage.

The controller should be examined once a week. The contacts, if burned, should be filed and sandpapered and lubricated with some good grease or vaseline. It is most important to see that all screws are tight, especially those that hold the fingers to the fingerboard. It is advisable also to take the lid off the resistance case once in a while and blow out the dirt that may have accumulated—at the same time, seeing if the connections are tight.

—The Red Jacketeer.

The Foreman and Costs

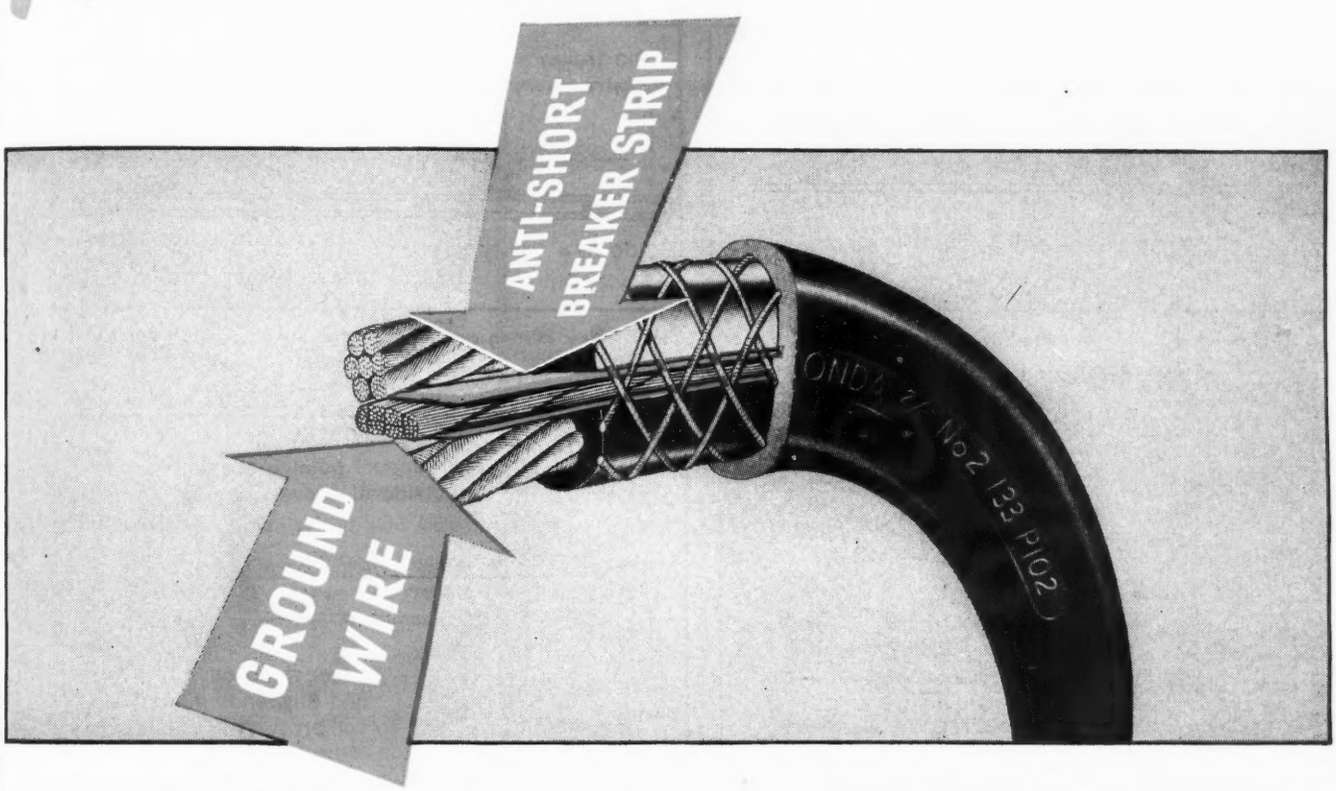
As management at the face, in the preparation plant, in the shop and elsewhere, the foreman vitally influences much the larger share of the cost of coal. Labor naturally is the biggest item where the foreman has a major influence. Next is supplies, followed by power and certain other mine expenses and operating charges. How these and other costs items stood in the bituminous industry in 1945, according to OPA reports, is shown in the following table:

	Hand Loaded	Machine Loaded	Strip Mined
Labor	$2.2746	$1.6786	$0.9794
Supplies	0.3466	$.4324	0.4499
Power	0.0898	0.0810	0.0605
Other mine expenses	0.0523	0.0485	0.1143
Other op. charges	0.4086	0.4037	0.4958
Administrative costs	0.0749	0.0715	0.0917
Selling	0.1269	0.1095	0.1366
Total	$3.3737	$2.8252	$2.3282
Avg. realization	$3.45	$2.99	$2.59
Average net margin	$0.08	$0.16	$0.26

A number—and perhaps most—of these costs have gone up since 1945, particularly labor. However, the table brings out a long-accepted fundamental of business, namely that a low production cost results in a better margin of profit. The coal industry aims at low cost through the use of machinery and, by so doing, puts itself in position to offer the customer a better price and thus wards off competition while racking up a profit more in line with actual cost. A better net means a stronger company, which means it is a better company to work for, whether a man is a supervisor or a miner. Organizations that make an adequate net profit, if it is based on efficiency, can stay in business, keep their operations efficient and pay good wages and salaries. Supervisors and men, therefore, should work to make sure that the company receives an adequate net. It means a better opportunity for them.

How labor is employed, how equipment is operated and how supplies, power and materials are used are big factors in the final results. While the engineers and top officials of the company can set up the plans according to best available information and provide the necessary equipment, the foreman or boss ultimately has the job of seeing that what should be done to get a low cost is done. By following the working plan, contributing suggestions for improvements, improving his supervisory ability and using materials and power economically, the foreman can improve his company's cost picture and help both himself and his men to a better living.

NEW... SMALLER DIAMETER PARALLEL MINING CABLE *PACKS MORE ON A REEL*



ANNOUNCEMENT: Here it is! A new Securityflex parallel mining cable with ground wire that packs more cable on a reel, thanks to its new, smaller diameter. Other advantages of this new cable are tough, flame and abrasion-resistant Neoprene outer jacket and unique, anti-short breaker strip construction.

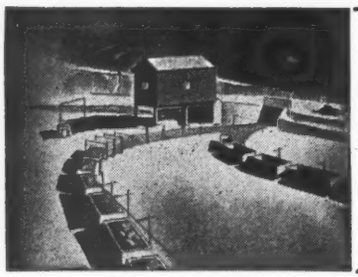
Meeting all specifications of the Pennsylvania Flame Test, this Securityflex cable is an investment in safe, continuous mine operation. *Anaconda Wire and Cable Company, 25 Broadway, New York 4, N. Y.* 47452A

IDEAL FOR SHUTTLE CAR SERVICE

Here is a parallel mining cable with ground wire that will stand up under severe abuse: Breaker strip construction cuts short circuits. This cable is ideal for shuttle car service.

ANACONDA *Securityflex* **CABLE**

ANACONDA from mine to consumer



Operating Ideas

Putting "Knee Action" in Trolley Systems

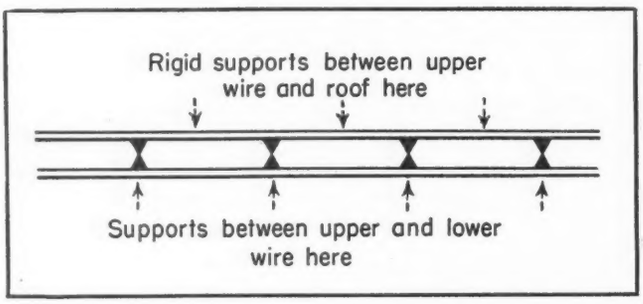


Fig. 1—How lower wire is supported from upper to provide catenary construction.

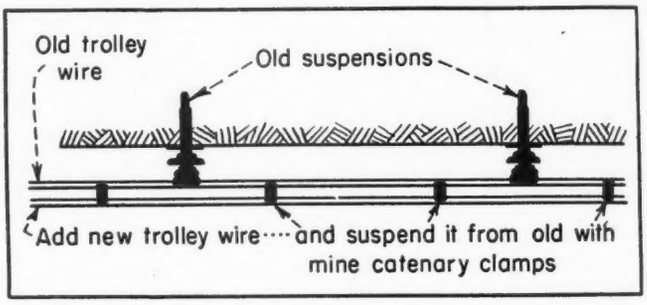


Fig. 2—How existing overhead is converted to catenary construction on a tangent.

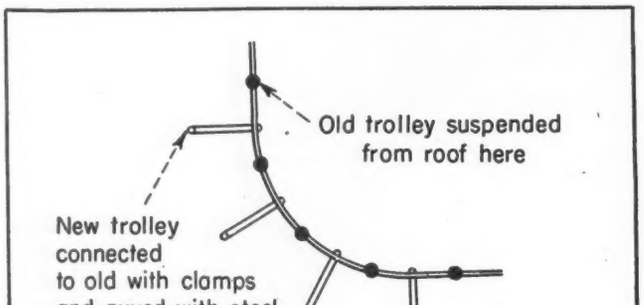


Fig. 3—Method of achieving catenary construction on curves using steel straps.

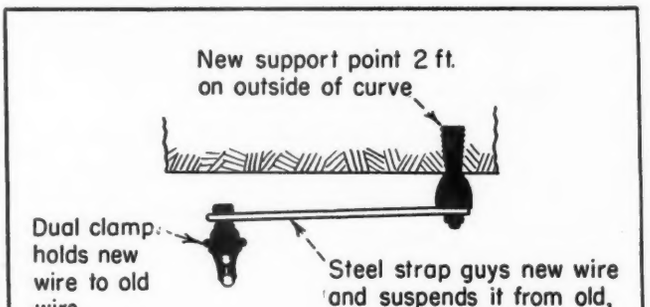

New support point 2 ft. on outside of curve
Dual clamp holds new wire to old wire
Steel strap guys new wire and suspends it from old, yet provides flexibility

Fig. 4—Showing support with steel strap carrying dual clamp for new wire.

"As electric railroads found out some time ago, catenary overhead construction adds years of life to trolley wire and reduces collector wear," states a recent issue of *O-B Haulage Ways*. "With rigid construction, such as is used on almost all underground mine trolley systems, hard spots exist at suspension points. Collector hammering at such spots tends to crystallize the wire and cause both arcing and burning.

"Because catenary overhead embodies no rigid connections between the trolley wire and the supporting structure, it eliminates such hard spots. Many mine operators have long appreciated this advantage of catenary construction and some have used it on outside haulage systems. However, the limitations of headroom and two-wire suspension on curves have proved serious obstacles to its use underground.

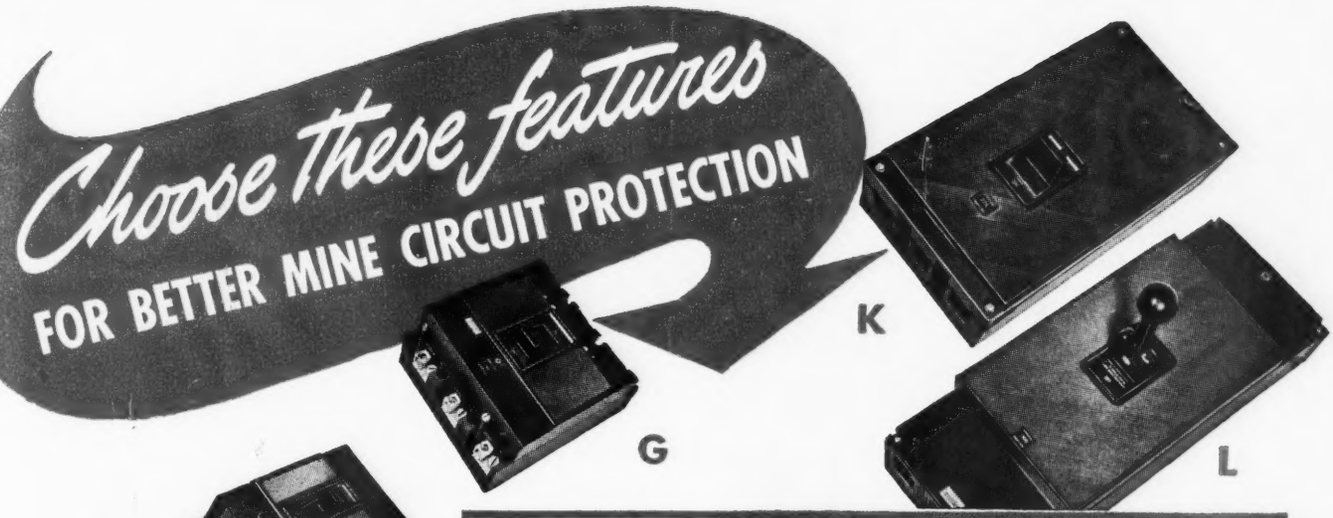
"Here is a simple method that overcomes these obstacles and, if followed, can bring the advantages of catenary underground, too. It involves the use of but several additional supporting items. It can be applied to existing rigid overhead as well as new construction. In brief, it consists of two overhead wires—a trolley wire and a feeder—with the supports between upper and lower wires as in Fig. 1.

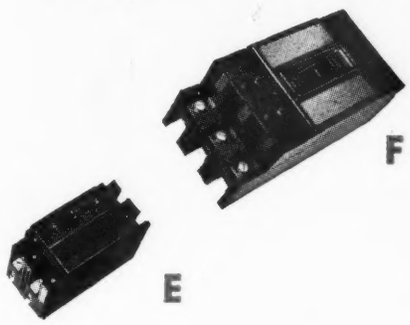
"As an example of how existing rigid overhead can be converted to flexible catenary, let us examine Fig. 2. The old overhead in this case consisted of a trolley wire suspended from the roof at regular intervals from a hanger and trolley clamp. To convert it to catenary, it is only necessary to suspend a new trolley wire from the old, using catenary clamps spaced about 4½ ft. apart. Clamps should not, of course, be spaced nearer than 2 ft. from the old roof supports. This type of catenary construction provides ample flexibility and requires only 1½ in. more headroom.

"The recommended practice for converting old trolley wire on curves to catenary is shown in Fig. 3. The curve in this case already is established by the trolley clamps holding the old wire in position. At proper intervals, dual clamps, which hold both the old wire in the upper groove and the new wire in the lower groove, are suspended flexibly from the roof with the aid of steel straps, as shown in Fig. 4. The strap braces the wire, keeps it from turning and provides the necessary flexibility. It does not extend below the trolley wire and hence requires no more headroom than the tangent construction previously described.

"Because the old trolley can be used both as feeder and messenger, a number of properties have found it more economical to change over to catenary when it becomes necessary to renew the trolley wire. Old wire used in this way is much more valuable than as scrap. Then, too, it provides an excellent way in which to add 'knee action' to your existing overhead—and with little additional cost."

Choose these features FOR BETTER MINE CIRCUIT PROTECTION





	E FRAME	F FRAME	G FRAME	K FRAME	L FRAME
Ampere Rating	10-50	15-100	35-100	70-225	125-600
Voltage Rating—a-c	250	250 & 600	250 & 600	250 & 600	250 & 600
Voltage Rating—d-c	125-/250*	125/250 & 250*	125/250 & 250*	125/250 & 250*	125/250 & 250*
Und. Lab. Int. Rating—Amps	5,000	5,000 & 10,000	5,000 & 10,000	10,000	10,000
NEMA Int. Rating—Amps	5,000	5,000 & 15,000	15,000	15,000	25,000
Quick-Make and Break	√	√	√	√	√
Thermal Trip Only	√				
Thermal & Magnetic Trip		√	√	√	√
Interchangeable Trip			√	√	√
Noninterchangeable Trip	√	√			
Adj. Magnetic Trip		√	√		
Nonadj. Magnetic Trip		√		√	√
Magnetic Trip Only		√	√	√	√
Nonautomatic Features	√	√	√	√	√
Shunt Trip Att.			√	√	√
Undervoltage Rel. Att.			√	√	√
Bell Alarm Switches		√	√	√	√
Auxiliary Switches		√	√	√	√
Electrically Operated Mech. Interlock	√	√	√	√	√
Safety Ground Trip		√	√	√	√

**Modified breakers available for voltage up to 600 volts, d-c*

Four-way protection is the one big feature of Westinghouse AB "De-ion" Circuit Breakers.

You buy more than *positive protection for circuits and machines* when you buy them.

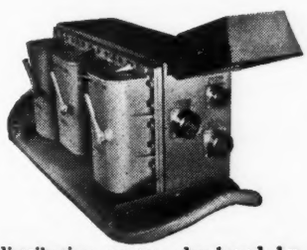
You buy *protection against wasted time.* AB Breakers do not trip on brief, harmless overloads. Machinery is kept going until it is necessary to break the circuit. When that happens, it is necessary only to flip the breaker handle to resume operation.

You are *protected against any further cost* because the first investment is the only cost. Nothing is destroyed when breakers trip. Nothing has to be stocked as a replacement part. And breakers that are sent into mine service have all parts heavily plated to prevent corrosion.

You also provide *protection for your workmen* when you install Westinghouse AB Breakers. The completely insulated enclosures are factory-sealed to prevent tampering of any kind, nor is it possible to hold the breaker closed against a dangerous current.

Westinghouse AB Breakers are supplied in a complete range of types and sizes for mine service, with standard and optional features as shown at right.

Enclosures using AB Breakers are available for explosive atmospheres. Ask your Westinghouse representative for facts and figures. Or write for Descriptive Data 29-060. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60646



This distribution center, developed by the Mines Equipment Co., St. Louis, Mo., utilizes specialized AB Breakers. A variety of enclosures is available, including Bureau of Mines approved units for mines with explosive atmospheres.

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PLANTS IN 25 CITIES... OFFICES EVERYWHERE

AB "De-ion" Circuit Breakers

Lift Gate in Trolley Permits Truck Passage

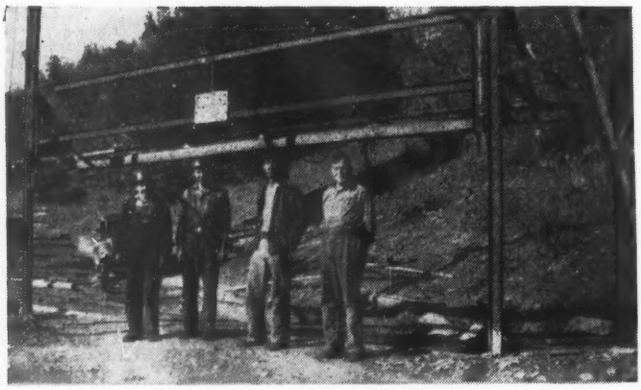


Fig. 1—Lift gate and the men responsible for it.

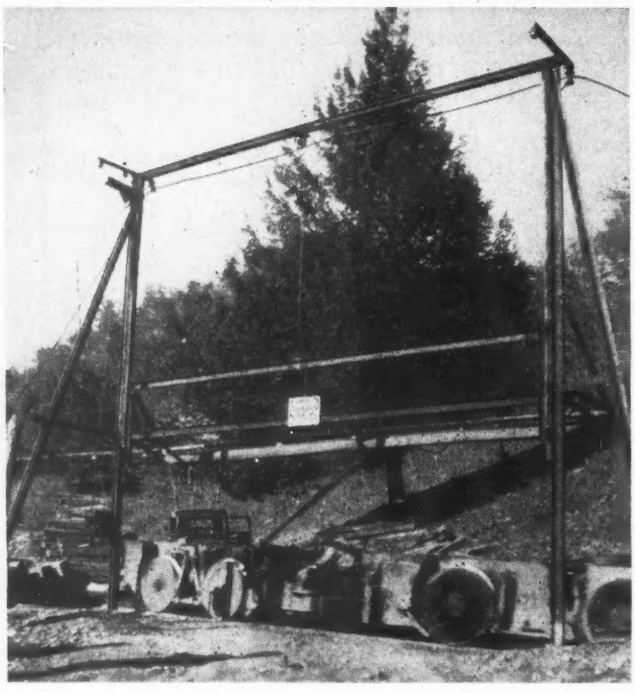


Fig. 2—Showing the gate with A-frame suspension and locomotive going through

"I WONDER IF EVERY MINE is blessed with men who are as good 'fixers' as some of ours here," writes C. T. Adair, general superintendent, Raven Red Ash Coal Co., Inc., Raven, Va., in transmitting the details of a lift gate in the trolley system. "The illustrations show a gate they designed and installed in the trolley wire over a truck road to our timber and supply yard.

"This road crosses our mine track at a point just west of the mine entrance and to get the wire high enough to clear the cabs of the trucks and at the same time low

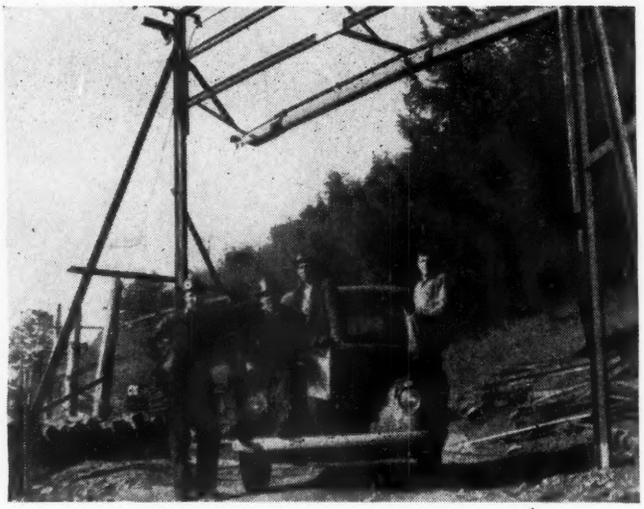


Fig. 3—Gate raised to permit passage of truck.

enough for the trolley pole to follow was our problem. Ramey Chambers, mine superintendent, and Louie H. Beavers, chief electrician and master mechanic, started kidding each other as to the best way to install the wire so trucks could serve the supply yard while retaining the trolley wire over the mine track. They asked me for suggestions and I told them that it was 'their baby' and to figure it out and we would ask P. L. Chafin, purchasing agent, to supply the necessary materials to complete the project.

"A few evenings later I went into the machine shop and they were in a huddle with Raleigh Turner, electrician. Each had a piece of railroad crayon and were sketching on the concrete floor of the tool room how they thought the device should be designed. At first, they approached the problem with the idea of hinging the trolley wire and swinging it out to make an opening when the trucks were to cross the track. The idea was tossed into the discard for Ramey's suggestion to erect an A-frame of steel rail and raise and lower the wire. So they got busy with the cutting torch and welding equipment and soon announced that the parts were ready to assemble.

"The illustrations show the results of their efforts and I would like to state right now that the money spent for this installation has come back to us a number of times since it went into service last year. Fig. 1 is a view of the gate in normal position for mine-locomotive operation. It also shows (left to right) Messrs. Beavers, Turner, Chambers and Chafin. Fig. 2 shows a locomotive going through the gate, with Harley Jones in the cab. Fig. 3 (again with Messrs. Beavers, Turner, Chambers and Chafin) shows the gate raised and a pickup truck crossing the mine track. The gate is raised by means of a small hand-operated drum, with the rope running through a sheave on the top of the A-frame. The feeder line to boost the trolley wire, and also the telephone line, are anchored to cross arms on top of the structure. As Mark Twain said about the ocean, 'Boys, she is a sucess.'"

Handling Sprockets and Bearings

TO SOLVE THE PROBLEM of the front-axle sprocket on a Jeffrey 29C cutter working loose from the axle key, Peter J. Bogus, mechanic at the Clyde mines, Republic Steel Corporation, Brownsville, Pa., reports that instead of changing axles, a clamp did the trick. Designed to fit tightly on the shaft, the clamp was made in two sections, fastened together with only two ½-in. bolts, and was put on the shaft next to the journal box. Now, says Mr. Bogus, "the sprocket stays in place as well as if a new axle had been put in, and saved many hours of labor as a result."

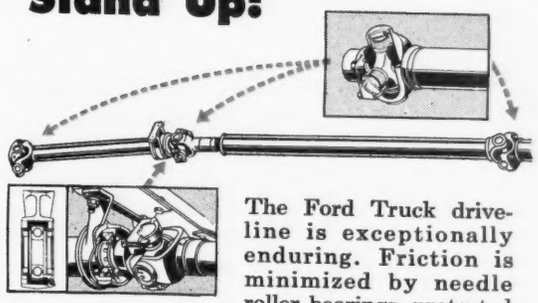
Mr. Bogus also offers a suggestion for putting ball bearings on all armature shafts. The suggestion is to obtain a section of brass deep enough for the purpose and wide enough for the bearing race. The brass is offset on the top so that a steel cap can be put on. Thus, when the bearing fit is tight, the chances of brass chips flying about is eliminated. The bearing also is protected since the brass rests on both the inner and outer races.

"WE AGREE— FORD TRUCKS LAST LONGER!"

Mr. Robert S. Swanson, treasurer, S. B. Thomas, Inc., Long Island City, N. Y., wrote recently: "In our fleet of 128 Ford Trucks, 36 are over 10 years old, and 6 are 1932 models—14 years old! Their reliability and economy have given us good reason to be thankful that Ford Trucks Last Longer."

The Ford heavy duty Dump Truck chassis has long been a favorite for coal delivery. Shown here with Gar Wood hoist and special 120-cubic-foot coal body by Mike and Joe Equipment Co., Rochester, New York.

ONE Big Reason— Ford Drive-Line Units Stand Up!



The Ford Truck drive-line is exceptionally enduring. Friction is minimized by needle roller bearings, protected by relief fittings, in all universal joints in all models. Half-ton chassis have two such joints. All other models (except 101" w.b.) have three, and, in addition, a heavy duty ball center bearing. This bearing is self-aligning—cushion-mounted in live rubber. It is leakproof, excluding dust and water. It is unaffected by frame flexing and is notably long-lived. Large-diameter tubular steel propeller shafts with forged ends are properly balanced. This assures freedom from destructive vibration and great strength without excess weight.

Ford

ONLY FORD GIVES YOU ALL THESE LONG-LIFE TRUCK FEATURES: Either of two great engines, the V-8 or the SIX, both with full pressure lubrication to all main, connecting-rod and camshaft bearings, Flightlight oil-saving 4-ring pistons, precision-type heat-resistant bearings and fast-warmup temperature control • rear axle design that takes all weight load off the shafts (¾-floating in half ton units, full-floating in all others) • heavy channel section frames, *doubled* between springs in heavy duty models • big, self-centering brakes, with heavy, cast drum surfaces, non-warping and score-resistant—all told, *more than fifty* such examples of Ford endurance-engineering.

NATURALLY, FORD TRUCKS LAST LONGER! Latest 1946 registration figures show that 78% of all 1936 model Ford Trucks in use 9 years ago are still on the job! That's up to 15.8% better than the records of the next four sales leaders—5% better than the average of all four. More than 100 body-chassis combinations. See your Ford Dealer!

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE

Electric Welders as Pipe Thawers

ELECTRIC WELDING EQUIPMENT has been used successfully to thaw frozen water pipes by a number of plant owners during the past few winters, according to R. F. Wyer, electric welding division, General Electric Co., Schenectady, N. Y. Welding equipment offers advantages over other electrical means because it is self-regulating and can be accurately controlled.

No special equipment is necessary for doing this work other than reliable pipe clamps for making firm connections. Strap-type copper clamps, capable of carrying several hundred amp. are desirable. C-clamps may be used to clamp cable terminals directly to the pipe where necessary. A file, rasp or abrasive cloth may be used to remove zinc oxide, rust, paint and grease to assure a good electrical contact.

Cable should never be wrapped around the pipe as a connection, since it is practically certain to loosen and may cause hazardous sparking. A portable voltmeter may be used for checking voltage drops and the continuity of circuits.

The connections to the welding generator are made in the ordinary way with the work lead and electrode lead both connected to the pipe on opposite ends of the frozen section so that the heat generated in the pipe wall by the passage of current will thaw the ice in the pipe. The method of getting at the pipe will vary in almost every case but, for economy, it is desirable to get as close to the frozen portion as is feasible without excessive digging in frozen ground. It also is desirable to set the machine at the lowest current adjustment at the beginning of a thawing period to permit checking connections with the least likelihood of flashing.

TABLE I—Data for Use of Welders

Pipe Diameter, Inches	Recommended Amperes	Approx. Minutes to Thaw	Recommended Cable Size	Resistance per 100 Ft. Cable
¼	75	15	No. 6	.0395
½	125	20	No. 2	.0156
¾	200	20	No. 0	.00984
1	250	30	No. 00	.00780
1½	300	30	No. 000	.00619
2	350	40	No. 0000	.00491
4	600	75	400,000 cm	.00270
6	800	120	600,000 cm	.00180

While the proper current for thawing pipes has been established at between 200 and 500 amp., the time needed to complete the job varies according to the size, length, kind and location of the pipe, condition of the surrounding soil, extent of the freeze and the temperature of the air. Tables I and II will help determine the various factors involved.

While the resistances given are for direct current, the reactance is so small that it ordinarily can be neglected when cables are not coiled. There are so many other variables in a given case that the voltage necessary to produce the current will be, for all practical purposes, the same for both a.c. and d.c. Table III shows the maximum outputs which can be obtained from the arc-welding equipment that normally would be used for pipe-thawing purposes.

Where welding sets are to be operated at less than 80 percent of their ampere rating, the operation can be continuous. That is, a 400-amp. d.c. set can be operated continuously at 320 amp. without damage. Likewise, a 500-amp. transformer can be operated at 400 amp. continuously. The sets may be operated at their maximum output for intermittent periods up to 15 minutes if sufficient time is allowed for return to normal temperature.

TABLE II—Ohm Resistance per 100 Ft. Standard Pipes

Pipe Diameter	Wrought Iron	Steel	Copper Tubing	Lead	Cast Iron Class A
½	.026	.0198	.00824	.0234	....
¾	.0202	.01485	.00445	.01371	....
1	.0138	.0100	.0034	.00984	....
1½	.00842	.00618	.00208	.0064	....
2	.00625	.0046	.00133	.0053	....
4	.....	.....	.....	.....	.0092
6	.....	.....	.....	.....	.006

When using arc-welding equipment for thawing purposes there are a number of precautions that must be observed. If a good, low-resistance joint is not obtained between the copper cable and water pipe, excessive heat will be generated at the connection. If the current is allowed to form an arc at this point it may damage the pipe.

Care should be taken to select the correct value of current where lead pipe is in the service line, because lead pipe will not stand as much current as iron. The pipes should be disconnected from the building piping before the thawing is begun so that the current has only one path to travel—through the section which is frozen. If this is not done, and where other devices are grounded to the water pipes, the ground wires may burn out and cause a fire, since the potential of the grounding connections will be raised above the potential of the earth.

In using single-operator d.c. sets, two points should be noted. The low-load voltage will result in the possibility of unusually heavy currents on the lower taps. Since these taps are designed to carry the low currents drawn at normal operating voltages, the result may be to overheat portions of the series field. This can be avoided by setting the units on the highest tap and lowest open-circuit voltage which will give the desired current.

In addition, the low-load voltage should be considered in making an estimate of the current setting required. Since load voltages in the neighborhood of 5 or 6 volts often will be encountered, the output current on any setting will be as much as 1½ times the current which would be drawn by a welding arc. With transformers, however, the current drawn by the load will be about as indicated on the nameplate.

TABLE III—Maximum Outputs

Welder		10 Volts	20 Volts	30 Volts	40 Volts
300-amp.	a.c.	500 amp.	450 amp.	400 amp.	375 amp.
500-amp.	a.c.	800 amp.	750 amp.	700 amp.	625 amp.
300-amp.	d.c.	650 amp.	600 amp.	500 amp.	400 amp.
400-amp.	d.c.	800 amp.	750 amp.	700 amp.	600 amp.
600-amp.	d.c.	1200 amp.	1000 amp.	900 amp.	700 amp.

As a final precaution, the resistance of the joints in the pipe should be determined. If the joints are insulated by rust or pipe dope, a spark may start a fire.

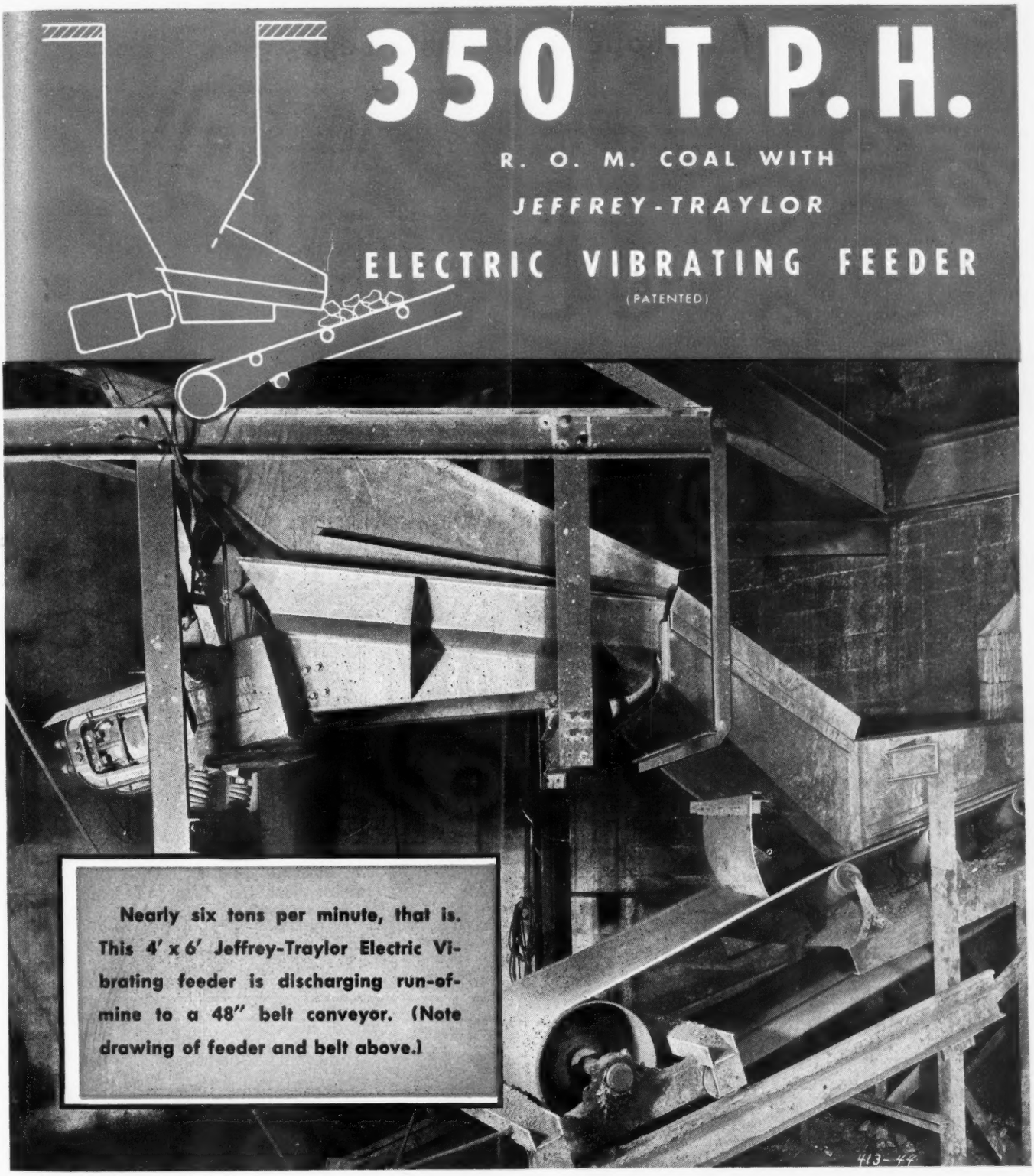
350 T.P.H.

R. O. M. COAL WITH

JEFFREY-TRAYLOR

ELECTRIC VIBRATING FEEDER

(PATENTED)



Nearly six tons per minute, that is. This 4′ x 6′ Jeffrey-Traylor Electric Vibrating feeder is discharging run-of-mine to a 48″ belt conveyor. (Note drawing of feeder and belt above.)

413-44

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Complete Line of Material Handling, Processing and Mining Equipment

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Rib Supports Eliminate Legs

CHANNEL-IRON SEATS welded to inverted-rail-type rib supports are used for supporting crossbars on the main entries at Maiden mine of the Kelley's Creek Colliery Co., Morgantown, W. Va., according to Roy R. Brown, superintendent.

The channel-iron-rail support, shown in the accompanying illustration, is fabricated from scrap pieces of 9-in. channel and 40-lb. rail. A 6-in. length of 9-in. standard structural channel, large enough to accommodate an 8x8-in. sawed crossbar, is welded to the base of an inverted section of a 40-lb. rail, near one end. The rail pieces are about 3½ ft. long and approximately 3 ft. of that length is inserted in the rib role, where each rail is tightly wedged or concreted in place.

This manner of timbering—eliminating the need of posts—improved safety records by tending to prevent additional accidents when derailments occur.

How the crossbar is supported by a channel-iron support anchored in the rib.

Chain Saw Facilitates Clean-Up Work

A small quantity of oil improves the cutting efficiency of the chain saw.

The chain saw cut through a 10-in. maple in approximately 10 seconds.

A GASOLINE-ENGINE-POWERED chain saw is available to the various collieries for clean-up work, says Johnstone Campbell, superintendent of the Drifton shops of The Lehigh Valley Coal Co., Drifton, Pa.

The model 6 Mall chain saw, shown in the accompanying illustrations, is loaned to the company's collieries for sawing scrap lumber and old timbers for clean-up work. The saw is powered with a 6-hp. gasoline engine and the 6x24-in. saw section can be pivoted for vertical and horizontal work. In clearing timber, as the illustrations show, the chain saw is useful for both felling and cutting up trees.

Do They Pay Out?

Time and time again operating ideas designed to meet some troublesome problem pay surprising dividends in a smoother operation, reduced costs or greater safety. Why not get added personal credit by sending us for publication any mechanical, electrical, operating or safety ideas you have put to work? If accepted, COAL AGE, upon publication, will pay you $5 or more for each.

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With 1900 hours of trouble-free bulldozing work behind it, this International TD-18 Diesel uncovers profits for its owner in Ohio.

"One of the most useful and satisfactory machines for strip mining jobs," you'll say.

This TD-18 cleans off the coal seam, builds coal hauling roads out of spoil banks and helps remove the heavy clay and shale overburden.

Tough working conditions like this are "run of the mill" for International Diesel Crawlers! Their superior performance, low fuel consumption, all-weather starting and inexpensive maintenance makes them your best bet for all-around work.

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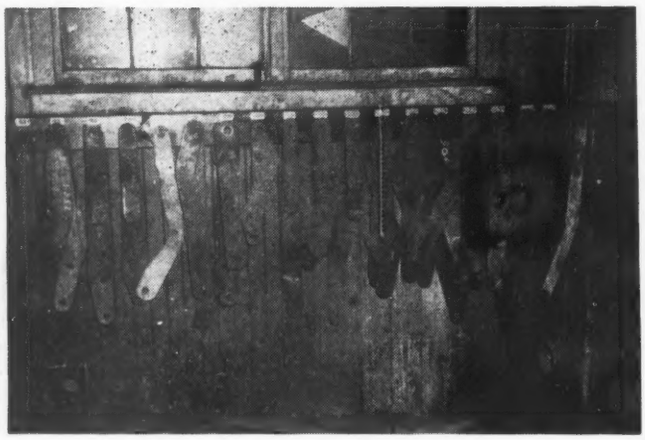
Brake Templates Hung Outside Shop Office



Templates for locomotive brake rigging parts are hung in an accessible place outside the shop office.

Each template bears the motor-type number and the coal company's drawing number.

TEMPLATES for the various brake-rigging parts for every make and type of locomotive used at the collieries are hung on the outside of the shop office for convenience, declares William Baskin, general foreman of the Drifton shop of The Lehigh Valley Coal Co., Drifton, Pa.

The templates, made from 3/16-in. stock and shown in the accompanying illustrations, bear the type number for the manufacturer's motor and also the Lehigh Valley engineering department's drawing number. When a new brake hanger is needed for a locomotive, the template is laid on bar stock and a new hanger "traced out" with a torch.

Hanging the templates on a nail keeps them grouped and saves them from becoming bent, which might easily happen if they were stored in a bin or shelf.

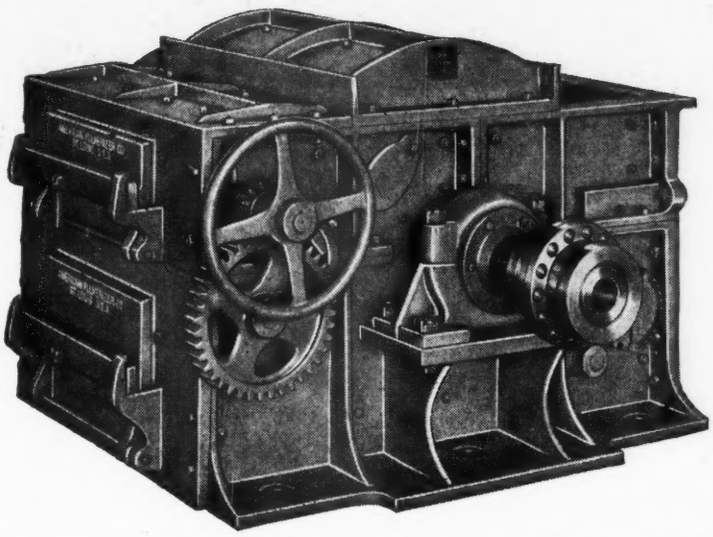
Spring Rod Gate Valve Controls Trip Sprinkler

Michael Yonko, general mine foreman, stands with his hand on the lever which the passing trips operate and Clyde Stottlemyer, mechanic who made the device, stands at the valve watching a test of the sprays.

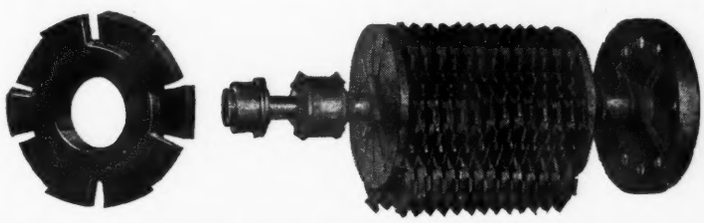
PLUG ACTION for an automatic device to turn water on and off for sprinkling loaded cars as they leave the section in No. 3 Mine, Rail & River Coal Co., Bellaire, Ohio, was provided by revising a gate valve. The threaded stem was replaced by a plain stem and the threaded portion of the yoke or bonnet removed.

From this valve, installed in a vertical feeder pipe and situated 12 in. above the bottom, a stem extension rod 20 ft. long connects with the lever stand. A coil spring in the rod and next to the stand normally keeps the valve gate in closed position. A lever with loop at the end extends out where it is deflected by passing trips. Those trips moving inbye merely compress the spring more and do not open the valve. The locomotive of a trip coming out swings the lever the other way and opens the valve at the right time to miss sprinkling the locomotive but catching the coal of the first car. Successive cars rubbing against the lever holds the valve open to spray the whole trip of cars as they pass along.

PREPARE YOUR COAL FOR MORE PROFITABLE MARKETING



The American "AC" Type Rolling Ring Crusher is made in a simple and compact design with heavily ribbed cast side frames. Joints are machined for dust-tight fit. The sectional design makes for easy dismantling or inspection of the crushing chamber.

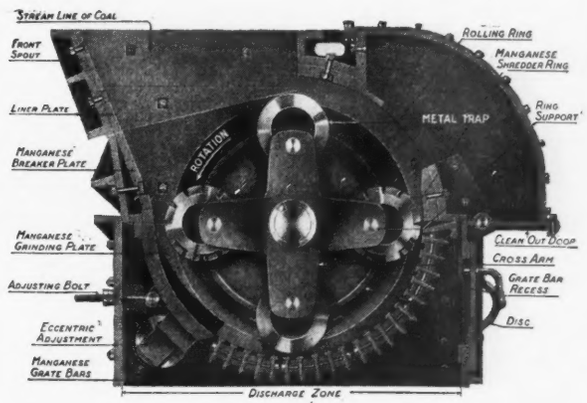


The twenty cutting edges on each of the manganese steel shredder rings and the many rings on the heavy rotor assembly above give high tonnage output at slow power-saving speeds with minimum fines. The cross section view at right shows how the shredder rings, revolving on individual shafts are free to deflect from tramp iron to give uninterrupted production and protect the crusher from injury. The easily cleaned metal trap catches and holds tramp iron.

AMERICAN ROLLING RING CRUSHERS

produce high tonnage with minimum fines and no oversize.

Easily marketable stoker and pulverizer sizes are profitably produced in American Rolling Ring Crushers. Through the splitting action of the patented shredder rings revolving at slower speeds, instead of the conventional crushing action at high speeds, sizing is held uniform in high tonnage production with a minimum of undesrable fines. Americans are doubly adjustable for great flexibility of sizing to meet seasonable requirements and market conditions. Americans are available in types to fit your operation . . . capacities from 50 to 500 TPH.



Send for "AC" Bulletin on coal crushing data and crusher specifications.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

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COAL MEN

A. S. Hand (left), assistant superintendent of tenements and subsidences, F. L. Zollinger, superintendent, and William Wirth, engineer, Loree Nos. 2, 3, 4 and 5 and Boston collieries, The Hudson Coal Co., Scranton, Pa.

J. F. Frantz (left), chief supply clerk, B. D. Wiseman, purchasing agent, Harry L. Swihart, general superintendent, George C. Auvil, chief electrician, and Paul Basforth, superintendent, Galloway No. 3 mine, Simpson Creek Collieries Co., Galloway, W. Va.

Glen Canada (left), chief mechanic and pit foreman, and Oscar Ernst, chief electrician, Buffalo Creek mine, United Electric Coal Cos., Dawson Springs, Ky.

Tom Perry (left), general mine foreman, and Joe Mellie, master mechanic, Galloway No. 3 mine, Simpson Creek Collieries Co.

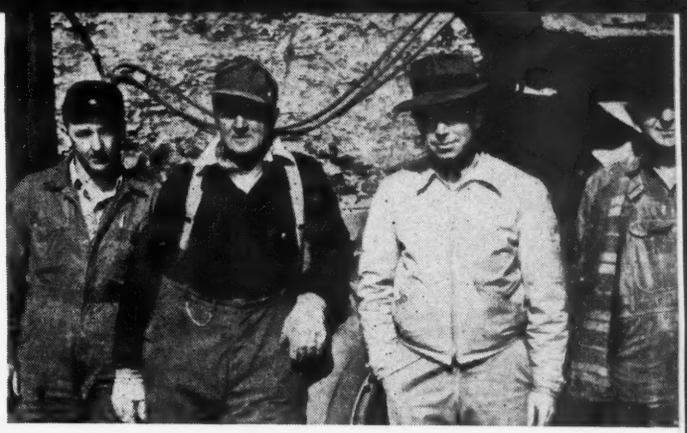
M. L. Markel, secretary, Somerset County Coal Operators' Association, Somerset, Pa.

R. W. Wotring, chief engineer, Simpson Creek Collieries Co.

C. F. Carpenter and Walter Laskey (front), assistant foremen; Leonard Bell and W. S. Keener (back row), inside mechanical foremen, Galloway No. 3 mine, Simpson Creek Collieries Co., Galloway, W. Va.

W. A. Hillyard (left), night foreman, and T. J. Gates, fireboss, Galloway (W. Va.) No. 3 mine, Simpson Creek Collieries Co.

ON THE JOB

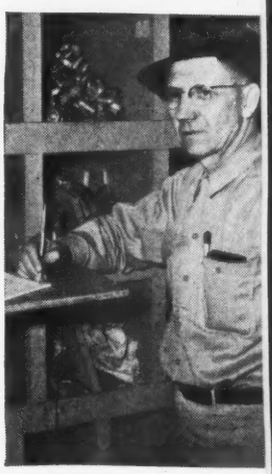


Jewell Cross (left), truck operator, Earl Mays, pit foreman, Don Johnston, superintendent, and Ursel Rothwell, tipple foreman, Mark Twain mine, Huntsville-Sinclair Mining Co., Huntsville, Mo.

L. H. Schnerr, manager, Somerset division, Pittsburgh Coal Co., Gray, Pa.

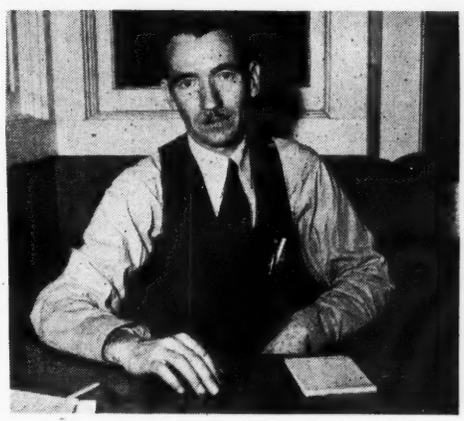
A. J. Wiegand, assistant general manager in charge of labor, The Hudson Coal Co., Scranton, Pa.

R. F. Donaldson, superintendent, Buffalo Creek mine, United Electric Coal Cos., Dawson Springs, Ky.



Owen Moss, supply clerk, Mark Twain mine, Huntsville-Sinclair Mining Co., Huntsville, Mo.

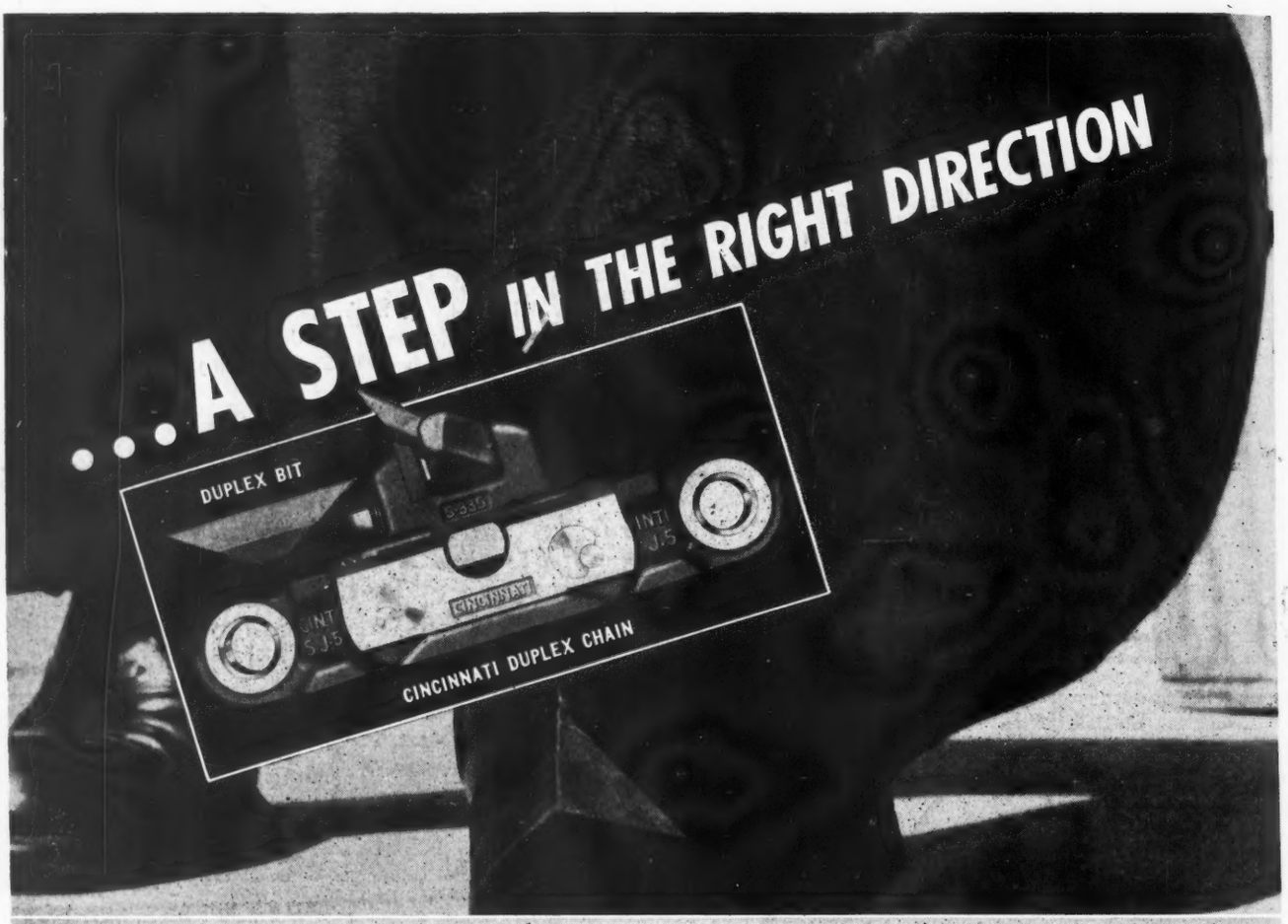
R. M. Von Storch, assistant superintendent, Loree Nos. 2, 3, 4 and 5 and Boston collieries, The Hudson Coal Co., Scranton, Pa.



William M. Black, assistant engineer, Loree colliery, The Hudson Coal Co., Scranton, Pa.

W. H. Wood, chemist, Mark Twain mine, Huntsville-Sinclair Mining Co., Huntsville, Mo.

Part of the supervisory force at Galloway No. 3. mine, Simpson Creek Colleries Co., Galloway, W. Va. Front row—(left to right), Tom Perry, general mine foreman, Paul Basforth, superintendent, Wade Drainer and John K. Spencer, section foremen, William Maxwell, supply foreman, H. T. Burner, track foreman, and Charles Lipscomb, section foreman. Back row—Glen Stemple (left), C. R. Wilson, Edison Mitchell, V. G. Gandy, Willis McCauley, section foremen, and Harry Newill, tipple foreman.



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HUNDREDS of Mine Operators, their superintendents, and engineers have found that Cincinnati Chains, Bits and Bars OUTLAST AND OUTCUT all others. Cincinnati Chains . . . both the DUPLEX and the STANDARD are made of high grade alloy steel . . . heat treated and drop forged and engineered to place the greatest wear and tear on easily replaceable long life parts. The Duplex double-ended reversible bit also reduces costs and saves time. It not only eliminates bit sharpening operations but reduces bit hauling time of mine sharpened bits by approximately 90%. Bit Setting Time is greatly reduced. Each point of the Duplex Bit outcuts from 2 to 6 ordinary Mine Sharpened Bits. Take a step in the right direction . . . equip your cutting machines with "CINCINNATI MINE" products.

CINCINNATI STANDARD CHAIN
Cincinnati Standard Chain accommodates Stanex Holder and Bit or regular ½" x 1" bit. Similar in design to the famous Duplex Chain.

STANEX HOLDER AND BIT
The Stanex Holder and factory made double-ended Stanex Bit fits all chains that accommodate the regular ½" x 1" bit.

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News Round-Up

Bituminous Negotiations Resumed As Tonnage Continues to Improve

Bituminous industry and union representatives sat down together April 29 prepared to begin, at least, talks leading to a new non-governmental contract, as the industry enjoyed a slight breathing spell following a turbulent month marked by an abortive safety stoppage, Congressional and state safety investigations, and some millions of words of charges, countercharges and recommendations voiced by government, Congressional, state, union and operator spokesmen.

The new meetings began at the invitation of Capt. N. H. Collisson, Coal Mines Administrator, issued April 16 in a letter to the union and 32 operators' organizations. First issue on the conference agenda was industry-wide bargaining, with Southern operators insisting on separate negotiations and John L. Lewis summoning his 250-man policy committee to consider whether the U.M.W. should stand on a nation-wide contract as voted last October at the U.M.W. convention in Atlantic City.

Two factors were thought responsible in some quarters for the ending of the safety stoppage called by John L. Lewis as the mourning week came to a close—the refusal on April 10 by Judge T. Allan Goldsborough to consider, in view of the stoppage, that the union had complied with the terms of the Supreme Court's decision, and the apparent reluctance of the miners to comply with the union's directive to stay out of the mines until they were certified safe by federal inspectors. Even on the first day of the stoppage, 700,000 tons, or 31 percent of normal, was mined, according to the Coal Mines Administration, and the tonnage continued to increase each day afterwards.

On April 3, Secretary of the Interior Krug had closed as unsafe 518 mines throughout the country, until conditions responsible were corrected and the mines were certified safe either by federal inspectors or by the combined approval of the government operating managers and the union safety committees. Other mines under government control were to be certified not unduly hazardous by the operating manager. In formally informing Lewis of this action, Capt. Collisson explained that the list of mines closed was not as accurate or complete as he would like to see it and invited Lewis to submit the names of any others that he felt should be included. Lewis replied April 4, requesting that all bituminous mines be closed except the two found safe, until they could be re-inspected by federal mine inspectors. In line with this letter, many of the union mine safety committees either recalled the certifications they had made or refused to sign them, and the resulting stoppage began.

In replying to Lewis, Capt. Collisson quoted the testimony Lewis had given before the House sub-committee on Education and Labor, during which he was asked whether the fact that Dr. R. R. Sayers had indicated that there were only two mines with a completely safe inspection report would mean that as far as he was concerned there were only two mines to which the men would go back at the end of the mourning period. Lewis replied, "No, no. Again the rule of reason enters into it." Capt. Collisson said he too would use the "rule of reason" and would not close mines not on the list of 518 if the operating managers certified their safety and the union committees did not object. The U. S. Bureau of Mines estimated that to re-inspect all 2,531 mines under government control, as requested by Lewis, would take over two months, with its force of 171 inspectors. The only two mines which Mr. Lewis favored reopening were those of the Union Pacific Coal Co. at Stansbury and Reliance, Wyo.

On April 10, the date on which Judge Goldsborough was to act on return of the union's $2,800,000, as directed by the Supreme Court, Judge Goldsborough granted the government's request for a delay on the case until April 24 so that the Justice department could investigate whether there had been a sincere and actual compliance with the order. The judge held that up to that time good faith had not been shown and said that while he did not doubt Lewis' "sincere grief" over the Centralia disaster, "there is evidence that the situation has been taken advantage of." The judge said he believed that actually good faith could not necessarily be shown in two weeks and that he thought the union should show before June 30 its good intentions.

A change of policy beginning April

Trustees of the U.M.W. Welfare Fund, posing together shortly after the announcement of the $1,000 death benefit payment for families of union members, are, left to right: John L. Lewis, U.M.W. representative, Thomas E. Murray, public member and chairman of the committee, and Capt. N. H. Collisson, Coal Mines Administrator and government member.

11, under which district union leaders allowed the reopening of mines without re-inspection by federal inspectors, was followed April 12 by the release of personal instructions from Lewis to the district leaders that they should allow such reopenings.

At the hearing April 24, when the government presented no objection, Judge Goldsborough ordered the return of the union's $2,800,000, which had been deposited under bond since the action went to the Supreme Court. Assistant Attorney General John F. Sonnett told the court that the government felt that the union had complied with the mandate and that coal production had been about normal since Lewis had ordered the safety stoppage ended. Shortly after return of the money, U.M.W. representatives donated $100,000 to the international offices of striking telephone workers.

During this period, Lewis appeared several times before House and Senate committees investigating the Centralia explosion and considering safety legislation. On several of the occasions he bitterly attacked Secretary of the Interior Krug, calling him directly responsible for the Centralia blast and demanding that Congress pass a resolution asking President Truman to remove him. In his testimony he proposed that legislation be passed making it mandatory for federal mine inspectors to close mines violating the Federal Safety Code.

Secretary Krug, in his appearance before the Senate Public Lands subcommittee investigating the Centralia explosion, repeatedly criticized the U.M.W. for non-cooperation in safety matters, declaring that the union officials had failed to accept their responsibilities and opportunities and charging them with "an almost unbroken record of neglect" in mine safety matters. Only 31 complaints had come from mine safety committees in 10 months, he said. He pointed out that many, if not most, of the "violations" arise from the practices of the miners themselves, many deficiencies from the Code cannot be corrected until equipment taking many months to secure can be obtained, and many of the violations reported were only trivial. He also stressed that a mine cannot be inspected as to many of the requirements unless it is operating and that it would be months before inspection of the 2,500 mines could be completed.

Secretary Krug submitted a five-point program to the committee, as follows: (1) mine operators "should continue, with more dispatch and vigor the program to achieve full compliance" with the code; (2) the U.M.W. should initiate "a thoroughgoing campaign to sell mine safety to its members"; (3) future contracts between operators and the union should include the safety code and some form of health and welfare fund; (4) enactment of legislation to allow the U. S. Bureau of Mines power to correct unsafe conditions; and (5) enlargement of the Bureau's inspection force to 1,500 men.

A bill giving the Secretary of the Interior police power over the mines was introduced into the House April 1 by Rep. Landis (R., Ind.) and referred to the committee on Education and Labor. Under the bill, the director of the U. S. Bureau of Mines is authorized to prescribe minimum standards of mine safety and both operators and miners are prohibited from using equipment, machinery or methods contrary to the standards. Operators also are restrained from operating a mine or allowing miners to enter a mine regarded as unduly hazardous or not meeting the safety standards. The bill is a revised version of the Coal Mines Inspection Act of 1941.

Action on the part of the miners themselves to promote safety was a significant development reported in the Pocahontas-Tug River field of West Virginia, when more than 500 miners attended a meeting in Welch, W. Va., April 20, and formed a safety council to increase cooperation between labor and management in achieving safety objectives. The group was reported to be the third formed in U.M.W. District 29 and a fourth was to be formed in the Greenbrier field with headquarters at Crichton. Other councils already had been organized in Fayette County for the New River field and in Raleigh County for the Winding Gulf area.

Speaking at the meeting, George J. Titler, president, U.M.W. District 29, urged the men to "meet the operators half-way and maybe further," for only in this way can the safety program be made effective. He called for a broad program to make every miner safety conscious so that he will watch out for himself and his fellows.

The long-awaited report of the survey of medical and sanitary conditions in bituminous coal-mining towns, undertaken last summer by the Coal Mines Administration, was released by Secretary of Interior Krug April 17. The report is based on a survey of actual conditions made by Navy personnel under Rear Admiral Joel T. Boone and was provided for by the Krug-Lewis agreement.

Secretary Krug, in releasing the report, condemned a majority of the coal-mining communities controlled by the operators as "a menace to healthful living," but his statement differed from the foreword of the report and the statement issued by the Department of Interior accompanying the report. The latter stated that while a "number" of company coal-mining communities were "attractive and sanitary," with well-designed and properly maintained houses and facilities, "many more coal camps are poorly maintained and are a menace to healthful living."

The report itself stated, "Any assertions which may have been made that inferior standards are general in the coal industry are disputed by the survey. Definitely low standards are readily apparent in certain places, but not in all areas where coal is mined. Provisions for health range from excellent on a par with America's most progressive communities, to very poor, their tolerance a disgrace to a nation to which the world looks for a pattern and guidance."

The report included nearly 50 recommendations for improvement of conditions and asked for action from operators, miners, the union, state and federal governments.

Coal Activity

Bituminous Coal Stocks

	Thousands Net Tons Mar. 1, 1947	P.c. change From Feb. 1, 1947	P.c. change From Mar. 1, 1946
Electric power utilities	13,453	+ 1.9	— 9.1
Byproduct coke ovens	6,645	+12.3	+ 3.4
Steel and rolling mills	985	+ 8.4	+ 3.9
Railroads (Class I)	7,682	+ 0.1	—30.5
Other industrials*	18,575	+ 1.5	+23.2
Retail dealers	2,131	—32.7	—31.5
Total	49,471	+ 0.6	— 3.3

Bituminous Coal Consumption

	Thousands Net Tons Feb., 1947	P.c. change From Jan., 1947	P.c. change From Feb., 1946
Electric power utilities	6,594	— 7.9	+33.7
Byproduct coke ovens	7,245	— 9.0	+99.1
Steel and rolling mills	904	— 4.1	+102.8
Railroads (Class I)	9,431	— 6.7	— 1.2
Other industrials*	15,681	— 4.1	+25.2
Retail dealer deliveries	12,544	— 3.1	—16.1
Total	52,399	— 6.1	+12.7

*Includes beehive coke ovens, manufactured-gas plants and cement mills.

Bituminous Production

March, 1947, net tons	54,995,000
P.c. change from February, 1947	+8.5
Jan.-March, 1947, net tons	164,605,000
P.c. change from Jan.-March., 1946	+1.9

Anthracite Production

March, 1947, net tons	4,964,000
P.c. change from February, 1947	+17.0
Jan.-March, 1947, net tons	14,359,000
P.c. change from Jan.-March, 1946	—5.9

Sales, Domestic Stokers Vs. Oil Burners

	Stokers	Oil Burners
February, 1947	2,141	71,574
P.c. change from Feb., 1946	—84.7	+244.8
Jan.-Feb., 1947	6,203	140,765
P.c. change from Jan.-Feb., 1946	—77.5	+197.3

Index of Business Activity*

Week ended April 19	194.8
Month earlier	194.4
Year earlier	166.6

*Business Week, May 3.

Electric Power Output†

Week ended April 19, kw-hr	4,660,320
P.c. change from month earlier	—2.0
P.c. change from year earlier	+16.9

†Edison Electric Institute.

BCR Seeks New Cuts In Mining Costs

Plans for a research organization to find new cost-cutting methods for bituminous mining were announced in Pittsburgh, Pa., April 24, by Bituminous Coal Research, Inc. The plans were revealed after a meeting of coal-land owners, executives of coal-carrying railroads and producers of over 200 million tons called by B.C.R. to

This hot-ladle crane cost more than $100,000 . . . but as it is it couldn't work!

You don't use this sort of equipment in mining, but it affords a splendid example of where false economy might be extremely costly.

This gigantic, 100-ton, ladle crane cost well over $100,000—but it couldn't pour a drop of molten metal without wire rope. That's what's missing in this picture. How much does wire rope cost? Ordinary wire rope—about $1500. The superior wire rope—Preformed Improved Plow Steel—about $1800.

Be safe. Be sure. Don't let penny wisdom keep you from having the best. Specify Preformed of Improved Plow Steel for your next rope. And when you buy a machine—any machine—make certain it is equipped with Preformed. You will like it because it lasts longer. Your workmen will like it because it is easier and safer to handle.

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consider "ways and means for rapid advancement of mining machines and methods to reduce the cost of coal production."

The proposed program would expand the bituminous industry's research activities by raising a special fund to finance the new study, naming a mining development committee of top-level executives from among the sponsors and establishing close liaison with manufacturers of mining machinery.

All commercial and captive bituminous operating companies, coal-land companies and coal-carrying railroads are invited to join in the proposed program. Further details will be announced after another meeting to be held in Pittsburgh in May.

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Connolly, Koenig Attend Geneva Labor Parley

H. J. Connolly, president, Pennsylvania Coal Co., as the official U. S. anthracite industry representative, and Robert P. Koenig, president, Ayrshire Collieries Corp., as the U. S. bituminous representative, left last month to attend the session of the Coal Mines Committee of the International Labor Organization opening at Geneva, Switzerland, April 24. They were named to represent the industries by the U. S. Department of Labor.

It was understood that following completion of the Geneva session Mr. Koenig will begin his duties as Special Technical Consultant to the U. S. Ambassador to the United Kingdom, Lewis W. Douglas, to which post he was recently appointed by Dean Acheson, Acting Secretary of State. Mr. Koenig will participate in a survey of the coal industry of the United Kingdom and is expected to remain in England about 60 days. He is accompanied by Mrs. Koenig.

•

Anthracite Prices Cut by Four Producers

Price cuts on anthracite ranging from 20c to 45c a ton, effective April 16, were announced last month by four major producers, The Glen Alden Coal Co., Philadelphia & Reading Coal & Iron Co., Lehigh Valley Coal Co., and The Hudson Coal Co. The savings were expected to be passed along to consumers. Shortly afterwards Joseph F. Lucking, president, N. J. Coal Dealers Association, announced that New Jersey dealers were reducing domestic anthracite prices from $16.35 to $15.75 a ton. A reduction of 60c a ton also was expected in the Philadelphia area, and in New York Burns Bros. April 21 announced a cut of 80c for domestic anthracite. Other dealers in the New York area were expected to follow suit shortly with cuts up to 70c.

MEETINGS

- American Mining Congress: annual convention and exposition, May 12-15, Cleveland Auditorium, Cleveland, Ohio.
- American Coal Sales Association: annual meeting, May 22-24, Virginia Beach, Va.
- Rocky Mountain Coal Mining Institute: spring meeting May 26-28, Utah Hotel, Salt Lake City.
- Mine Inspectors Institute of America: annual convention, June 1-4, Denver, Colo.
- Illinois Mining Institute: summer meeting and 27th annual boat trip, leaving St. Louis, Mo., June 6, at 10:30 p.m., and returning Sunday morning, June 8.
- American Coke and Coal Chemicals Institute: annual meeting, June 9-11, French Lick Springs Hotel, French Lick, Ind.
- American Retail Coal Association: annual meeting, June 9-11, Hotel Morrison, Chicago.
- American Society of Mechanical Engineers: semi-annual meeting, June 16-19, Stevens Hotel, Chicago.
- American Society for Testing Materials: annual meeting, June 16-20, Chalfonte-Haddon Hall, Atlantic City, N. J.
- Smoke Prevention Association: annual meeting, July 7-10, Royal York Hotel, Toronto, Ont., Can.

Nine Miners Killed In Anthracite Explosion

An explosion at 7 a. m. as the shift was about to begin killed nine anthracite miners and injured nine more, three critically, April 10, in the Marcy seam of the Schooley colliery, Exeter, Pa., operated by the Panzitta Coal Co. While the exact cause was yet to be determined, it was believed that a pocket of gas in an abandoned area had been ignited.

The mine had been regarded as safe by federal inspectors who had inspected it late last year. It also had been inspected six times since the beginning of this year by state inspectors, who had reported it in good condition.

According to a joint statement by D. H. Connelly, in charge of state investigators, and E. H. McCleary, supervising engineer, U. S. Bureau of Mines Wilkes-Barre, issued April 15 after a two-day inquiry, faulty ventilation permitted gas to accumulate and the negligence of a mine foreman, who apparently was acting as fireboss, in not making a pre-shift examination permitted the men to enter the mine. Further investigation will be made when the section where the explosion occurred is rebuilt.

New Pipeline Developments

Objection to the application of the Pittsburgh group of the Columbia Gas & Electric Corp. to build additional natural-gas pipelines in Pennsylvania, New York, West Viginia and Ohio was withdrawn by the Anthracite Institute April 15 after agreement by the applicants before the FPC that the proposed lines would be used to serve existing customers more adequately and not open up new territory. The estimated cost of the new facilities is $6,762,691.

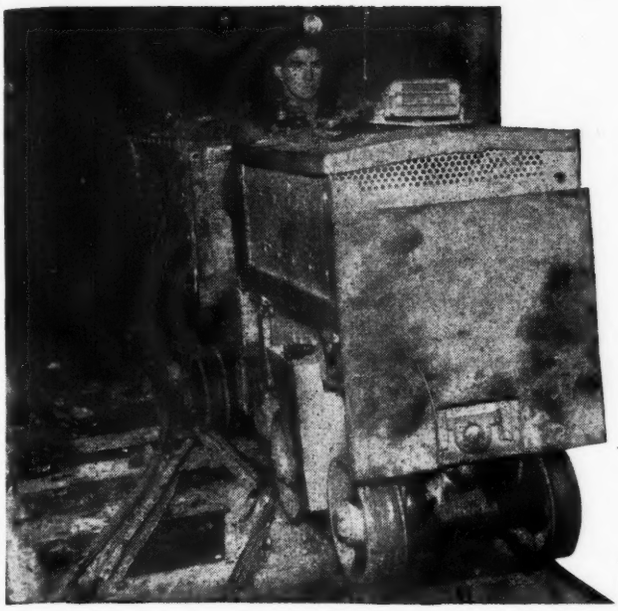
Among the various applications filed with the FPC recently was that of the Trunkline Gas Supply Co., a new firm that proposes to construct 855 miles of 30-in. high-pressure line from Wharton County, Texas, to Keokuk, Iowa. The line, which will have a capacity of 425,000,000 cu. ft. daily and cost $74,266,507, will utilize flare gas now wasted and sell it to interstate lines crossing the route.

Panhandle Eastern Pipe Line Co. filed with the FPC an application for authority to construct and operate additional pipeline facilities in Texas, Kansas, Missouri, Illinois, Indiana and Michigan, which will raise the peak-day capacity of the system from 473,000,000 to 580,000,000 cu.ft. and cost an estimated $23,464,000. Included in the project is 356 miles of 26-in. pipeline. In a recent opinion, the FPC defined Panhandle Eastern's rights in the Detroit and Ann Arbor areas, which have been in conflict with the activities of the Michigan-Wisconsin Pipeline Co., recently granted a certificate by the FPC. The opinion states that after expiration of present contracts in 1951 Panhandle Eastern is to be afforded reasonable opportunity to deliver volumes of natural gas equal to that sold by it in 1942 or 1945 or an average of 1942 through 1946, with the right to share in the area's future growth.

The Northern Natural Gas Co. was authorized by the FPC to construct 185 miles of loop lines, additional compressors, stations and facilities, to enable it to increase its deliveries to Clifton, Kans., by 82,000,000 cu.ft. daily. Increased firm market demands necessitated the enlargement.

The Southern Natural Gas Co. has applied to the FPC to construct over 700 miles of pipeline to increase its present capacity of 255,000,000 cu.ft. daily to 490,000,000, to serve increased demands in the territory already covered, including new customers of companies to which it distributes. A 375-mile 24-in. line from the Gwinville field to Atlanta, Ga., is included as well as facilities to serve various communities in Tennessee, Mississippi, Alabama and Georgia.

The United Gas Pipe Line Co. has asked the FPC for authority to construct 93 miles of 18-in. pipeline from the Baxterville field to its lines near Mobile, Ala., and to replace 8½ miles of 12-in. pipe with 16-in., increasing capacity 100,000,000 cu. ft. daily.



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He may at some time have had a wreck—such as a locomotive falling into a shaft or rolling down the side of a waste dump—and found that the battery not only survived with little or no damage but later went on and delivered full service life.

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Or, he may have discovered that he can use "worn-out" motive power batteries for various kinds of lighter-duty standby work for which their capacity is still ample, and thus can get more years of dependable service from them.

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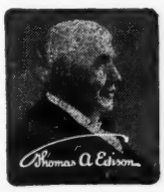

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Cables and Grounding Surveyed At Beckley Joint Meeting

Grounding mining machinery and specifications of trailing cables were among the topics discussed at the fourth annual joint meeting of the New River & Winding Gulf Electrical & Mechanical Institute, the West Virginia Section of the American Institute of Electrical Engineers and the American Mining Congress Committee on Underground Power, at Beckley, W. Va., April 11-12.

Four papers were presented at the opening session Friday afternoon, with C. C. Ballard, master mechanic, New River Co., acting as chairman. E. M. Hansford, electrical engineer, Electro Metallurgical Co., served as chairman at the evening meeting that followed the dinner held in the Methodist Temple dining room. At that session, F. R. Adair, engineer, Philadelphia Lamp Division, Westinghouse Electric Corp., described and demonstrated numerous types of incandescent and fluorescent lamps.

Saturday morning, the American Mining Congress Committee on Underground Power met in a general session and in sub-committee sessions in the Beckley Hotel. Reports were submitted at luncheon.

Standard equipment of a Femco two-way radio set for mine communication, furnished by the Dixie Appliance Co., Bluefield, served as a public address system for the sessions in the Memorial Building. Men speaking from the floor were passed a microphone of the type used by the motormen in mines where this system is in use.

The Bureau's recommendations for grounding underground a.c. and d.c. machinery were explained by T. R. Weichel, electrical engineer, U. S. Bureau of Mines, Mt. Hope, W. Va., who gave a paper entitled "Grounding Underground Equipment." Protective grounding is vital, he stated, and while its principal function is safety to persons and property, it has the secondary function of improving operation. Because portability is required, grounding in mining is a mechanical as well as an electrical problem and has resolved itself into making the grounding suitable to the duty involved.

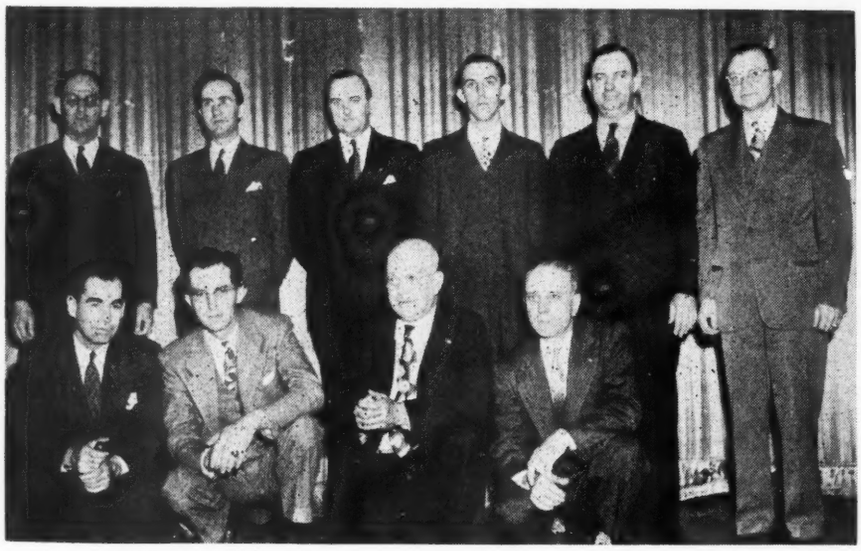
Frames of d.c. motors should have separate grounding conductors in the feed cable and not use the grounded power conductor as a ground. The grounding conductors should be connected to the track at a connection other than that of the grounded power conductor so that a break from the track does not sever the ground. Two pieces of portable equipment such as a loading machine and a shuttle car that work together should have their grounding conductors connected to the track at one point to minimize the possible potentials between their frames.

Mr. Weichel mentioned recent experiments and trials with circuit breakers to open cable power circuits when a leakage to ground occurs and said the system appears to have merit.

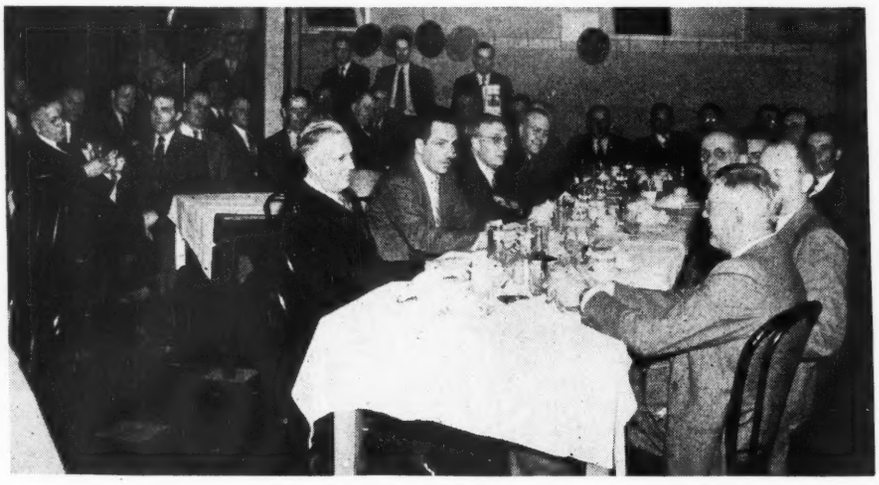
In the discussion, J. O. Cree, West Virginia Engineering Co., Charleston, spoke of difficulties encountered from grounds developing in controllers of old types of mining machines after frame grounding conductors were added to the cables. He also mentioned instances where junction boxes have blown up, apparently because the insulation was not adequate to withstand the full potential imposed by the grounding conductor under the normal conditions of moisture condensation from mine atmospheres.

D. E. Renshaw, Westinghouse, made a point for solid grounding, stating that personally before touching the frame of a piece of equipment he wanted to know that he was not likely to get a shock should the insulation be bad. In regard to insulation failures of controllers on old mining machines and junction boxes, one speaker remarked that locomotive frames are always grounded by contact with the rails and through necessity the insulation in them has been developed to stand the voltage.

Failures of low-voltage trailing cables are caused mainly by mechanical failures, said C. B. Peck Jr., product specialist, Anaconda Wire & Cable Co., in his paper on "Mining Cables,



Some of the speakers and officers at the Beckley, W. Va., meetings April 11-12, are, left to right—standing: C. B. Blackwell, dean, Morris Harvey College; J. R. Casey, Turbine Division, General Electric Co.; E. M. Hansford, electrical engineer, Electro Metallurgical Co.; A. Garret Jr., electrician, New River Co.; E. A. Rickard, purchasing agent, New River Co. and T. R. Weichel, electrical engineer, U. S. Bureau of Mines, Mt. Hope, W. Va. Kneeling: C. B. Peck Jr., product specialist, Anaconda Wire & Cable Co.; W. Sweitzer, chief electrician, Minden Mine, New River & Pocahontas Consolidated Coal Co.; C. C. Ballard, master mechanic, New River Co.; and Luther Fink, machinist, Slab Fork Coal Co.



Luncheon session at the Mining Congress Committee on Underground Power, at Beckley, W. Va., April 12.

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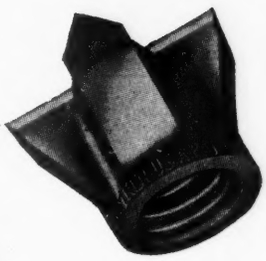

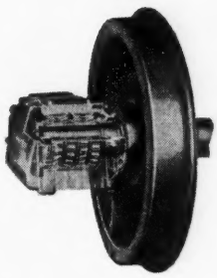

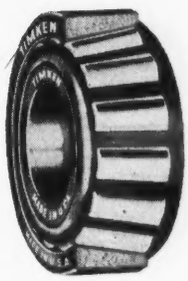

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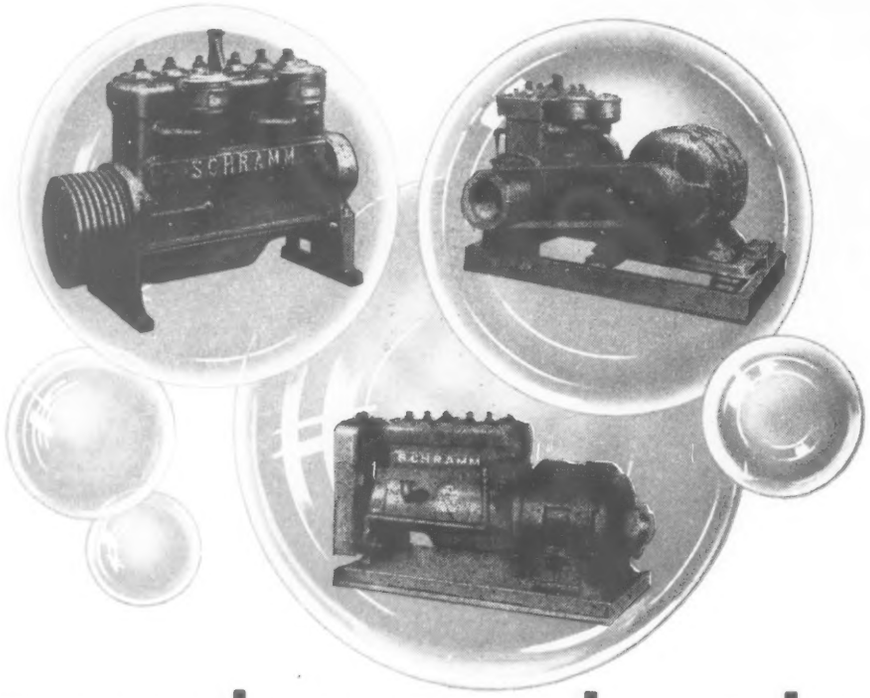

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EQUIPMENT APPROVALS

Five approvals of permissible equipment were issued by the U. S. Bureau of Mines in March, as follows:

Mines Equipment Co.—Distribution box; 220 volts, a.c.; three 3-wire branch circuits equipped with circuit breakers; Approval 571; March 6.

Joy Mfg. Co., La-Del Division—Electric-drive unit for blower fan; 1-hp. motor, 230 and 550 volts, d.c.; Approvals 572 and 572A, respectively; March 7.

Joy Mfg. Co., La-Del Division—Type MTB26 belt conveyor; 25-hp. motor, 230 volts, d.c.; Approval 573; March 7.

Goodman Mfg. Co.—Type 660 tractor loader; two 30-hp. motors, 250 volts, d.c.; Approval 574; March 17.

Jeffrey Mfg. Co.—Shortwall loader; 50-hp. motor, 250 volts, d.c.; Approval 533; March 18.

Present and Future." He predicted that better cables will be developed, probably by using compounds that contain some type of plastic.

Excessive tension plus worn guide spools that wear and tear the jacket are responsible for many failures. Hot cables with softened jackets and softened insulation present the fire hazard but that difficulty has been greatly minimized through manufacture of cables meeting the Pennsylvania fire test, which, according to Mr. Peck, will soon be a U. S. Bureau requirement. Because rubber is compressible and allows conductors to get closer together, better insulations will have to be devised, he said.

In good cable, the conductors do not twist nor shift position in the jacket and the conductor insulation is bonded to the jacket so that in going through guides the jacket will not hang back. Concentric cable is hazardous in a coal mine and is rapidly disappearing. In making repairs on that type, electricians often reduce its capacity by cutting out strands to hold the size of the splice to practical limits.

Type W cable, which is the twisted type with round jacket, is not satisfactory for reeling. Parallel cable is the best all-around cable because it is less subject to shorts, which holds true even when the cable must contain a third or grounding conductor. It is cheaper in the long run to make good splices, removing the cable every so often and resplicing with a vulcanizer.

Mr. Peck expressed the fear that a coming standardization of cable diameters by the U. S. Bureau of Mines

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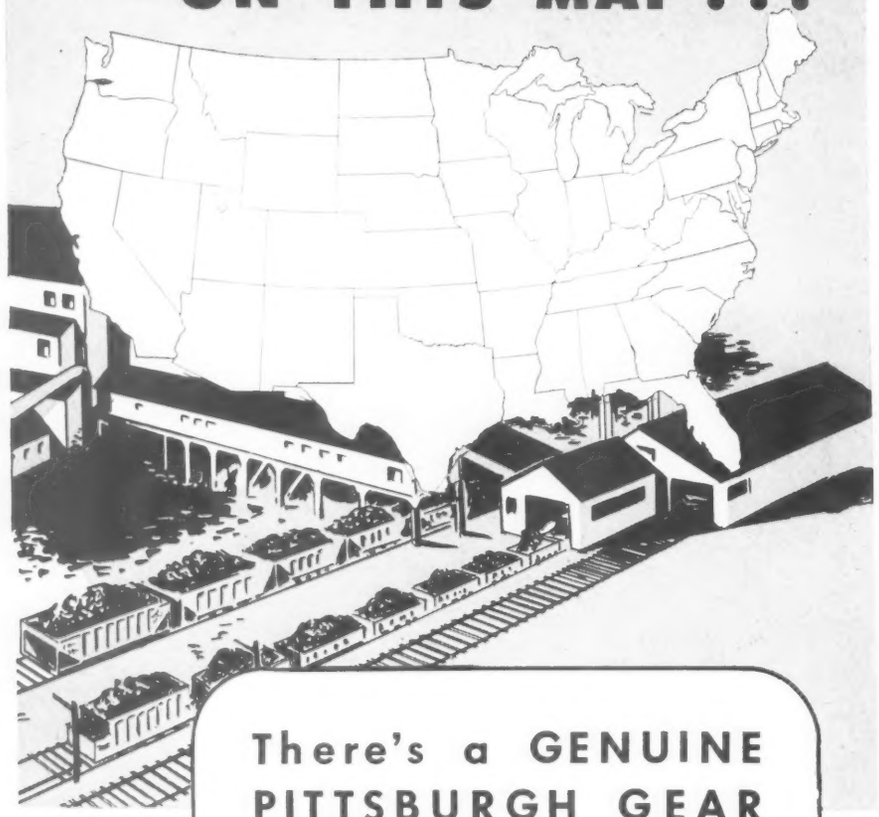

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will in some cases bar the use of parallel cable (safest type) in favor of round cables, because the proposed standards for the parallel type call for dimensions larger than some think advisable. There will be difficulty in getting enough parallel on a reel.

Some cable difficulties arise because replacements are often made with the same size and type of cable that came on the machine, while actually that type may not be suitable for the specific duty in a particular mine. In speaking of excessive tension, Mr. Peck said that conductors of No. 6 cables on shuttle cars are actually being pulled right in two. During the discussion following the paper, Mr. Renshaw said that with reels that are built to restricted dimensions and provided with sufficient cable tension when full, the tension increases considerably when the reel is about empty of cable. There should be an effort to provide a larger and more suitable space for the reels on shuttle cars.

J. R. Casey, Turbine Division, General Electric Co., talked on the gas turbine as applied to aircraft and showed a film, "Jet Propulsion." In the evening, Dean C. B. Blackwell, Morris Harvey College, Charleston, read a paper on "The Future of Atomic Energy."

At the Mining Congress luncheon Saturday, sub-committees reported progress toward recommendations on protective grounding and on cable standardization and practice. Further reports will be submitted at the next meeting of the Committee on Underground Power, which will be held at the Coal Show at Cleveland.

•

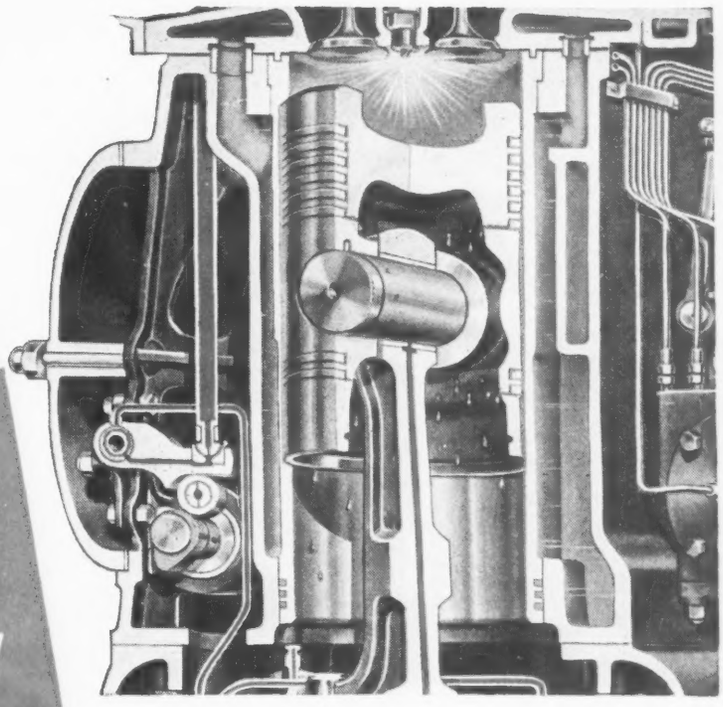
New Developments

• Opening of three mines now under development and three others now in the planning stage will involve expenditures by the Island Creek Coal Co. of $7,500,000 to $10,000,000 in the next two or three years, according to the company's annual statement recently issued. Purpose of the expansion program, the company said, is to replace tonnage from depleted mines and maintain an annual average production of 7,000,000 tons.

Of the three mines now being developed, which will mine the Cedar Grove seams on property of the United Thacker Coal Co., a subsidiary, Mine No. 24 was producing at the rate of 50,000 tons monthly at the end of 1946 and is expected to reach its full capacity of 1,200,000 tons annually about July 1.

Completion of the slope to Mine No. 25 is expected about May 1 and development and production of coal will begin shortly thereafter, with the coal being handled by the No. 26 tipple until the No. 25 tipple is completed about April 1, 1948. Full production of Mine No. 25 at 1,200,000 tons yearly is planned for fall, 1948.

Both Nos. 25 and 26, development



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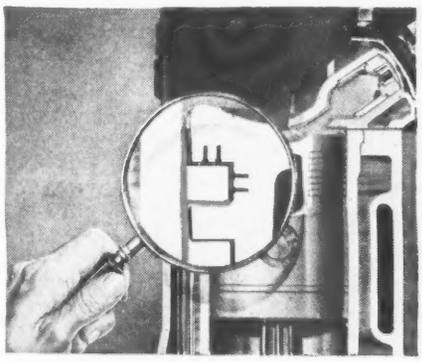

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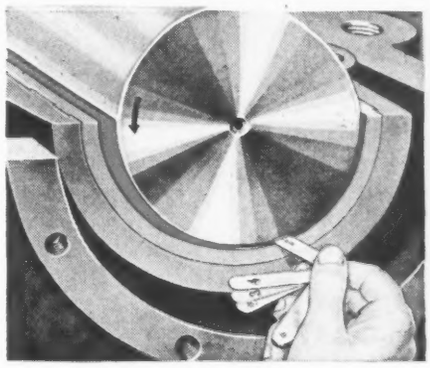

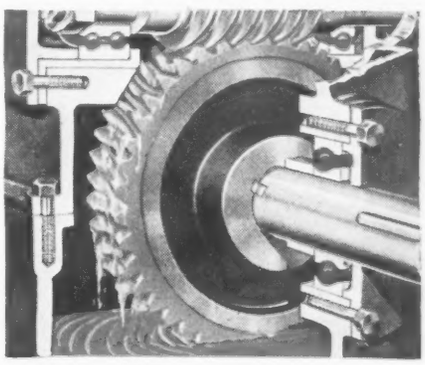

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of which was begun late in 1946, will mine two Cedar Grove seams lying 40 ft. apart, Mine No. 25 in the lower seam and No. 26 in the upper. The slopes will be about 100 ft. apart and development of the two mines is proceeding simultaneously. Coal was reached in Mine No. 26 in March and it is expected that the temporary tipple will be operating and commercial production started around July 1. Capacity production of 500,000 to 600,000 tons annually is anticipated about a year later.

Plans under way for the opening of three additional mines call for one mine in the Eagle seam with a capacity of 500,000 tons yearly and two mines in the Cedar Grove seams, each with a capacity of 1,000,000 tons annually.

Options also have been taken, the company states, on 6,000 acres of new lands that are now being drilled and surveyed. If development work proves satisfactory and the property is purchased, it is expected that an additional mine, will be opened there in the very near future, with an annual capacity of 750,000 to 1,000,000 tons.

• Operations at the strip mine near Cumberland, Ohio, owned by the Central Ohio Coal Co., a subsidiary of the Ohio Power Co., were expected to begin last month. The mine, which is to be operated by the Commercial Fuel Co., Pittsburg, Kan., is to have an anuual capacity of 750,000 tons and provide coal for the Philo plant of the Ohio Power Co. Approximately 12,000 acres of land in Muskingum, Noble and Guernsey Counties is available. George Wilson is superintendent of the mine and Frank Coulson is supervisor of mining activities for the Ohio Power Co.

Coal will be cleaned and loaded onto the Baltimore & Ohio R.R. in a washing plant of 600-t.p.h. capacity. Overburden will be removed by a 32-yd. Marion shovel now under construction and coal will be loaded by a 7-yd. Marion shovel into Euclid trucks. Power will be brought in at 33,000 volts, with a 1,000-kva. transformer serving the preparation plant and three 500-kva. transformers for stripping and loading. A thorough program of reforestation is planned as soon as the operation progresses sufficiently.

• The Peabody Coal Co., Chicago, recently announced that extensive mining operations would be started at its Majestic Mine No. 4, DuQuoin, Ill., to compensate for production from its Mine No. 18, West Frankfort, Ill., recently closed as uneconomical. As soon as the proposed expansion has been completed, 350 to 400 miners formerly employed at Mine No. 18 will be added at Majestic No. 4.

• Loading facilities at the new strip mine of the Laurel Fork Coal Co. in Tazewell County, Virginia (*Coal Age*, February, p. 134), was nearing com-

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pletion last month and actual operations were expected to begin shortly. Charles Waggoniere, of Cumberland, Md., is superintendent of the operation.

• The Tennessee Coal, Iron & R.R. Co. has contracted with the Goodyear Tire & Rubber Co. for installation of a ½-mile-long rubber conveyor belt to deliver coal from the bottom of the slope to the tipple at its new Concord mine near Birmingham, Ala., which is expected to begin operation late this year. The belt will raise 600 tons of coal per hour to a height of 715 ft. on an incline of 17 deg.

When completed, the 42-in. belt will weigh 42 tons and will be delivered in five sections for splicing into one continuous length on installation. It will have a 3/16-in. cover of especially formulated synthetic rubber on the top side and 1/16-in. on the underside, for a total belt thickness of ⅝-in.

Recent development of steel-cable cords in the carcass of the belt, in place of conventional fabric or cotton cords, permits building a belt of this length and high load-carrying capacity, according to manufacturer's representatives, who also state that the height of the belt is the highest ever attempted in conveyor-belt operation. The belt utilizes more than 330 steel cables, each endless inside the belt's circumference and each consisting of finely stranded, high-tensile steel wire. One 300-hp. motor will be placed on each side of the pulley shaft and total belt pull on the head shaft will be 68,000 lb.

•

State Officials Seek Anthracite Strip Rule

Legislation regulating anthracite strip mining, similar to the 1945 law for bituminous stripping, was reported being prepared by state officials last month. It was understood that Gov. Duff was seeking to avoid the disputed parts of the 1945 bituminous bill, which is still being contested in the Dauphin County court. Under the bituminous bill, operators are required to restore the overburden and reforest the stripped acreas, under penalty of forfeiture of a bond posted with the state.

•

Island Creek Sells More Miners' Homes

Sale to the Aldredge Land Co. of 200 miners' homes on Mud Fork, comprising the bulk of the miners' dwellings in communities near its Mines Nos. 15 and 16, was completed March 21, the Island Creek Coal Co. has announced. The new owner is expected to place the houses on sale immediately and the present occupants are to have first call on their purchase. Other Island Creek housing on Whit-

WORLD LEADERSHIP...

Our Duty and Our Opportunity

CAPITALISM in Europe and the rest of the world is challenged by a real and formidable rival, communism. For capitalism to thrive a reasonable amount of prosperity is essential. Communism uses poverty to advance itself.

Except for the Western Hemisphere, most of the world came out of the war poor. Two years after V-E Day it is still poor. It needs dollars. It needs credit. It needs capital. It needs trade. It needs technical and managerial skills.

If we in America are to help the rest of the world back to its feet, starting it again on the road to peace and a free economy, we should try to supply those needs within the limits of our capacity.

We must not overtax our own strength. For the first requirement of a stable world is a strong United States. But we must accept leadership in international economic recovery—in our own self-interest.

What can the United States do to help men back to prosperity in a world economy which will allow them *freedom and incentive?* There are many things. But here are two of the most important:

1. The United States, through Congress, must determine the pattern and the total of the foreign loans or grants it can afford. We must answer three questions. How much will the new program cost? Can we afford it? Have we the technicians and managers to watch the loans, assuring their fruitful use?
2. We must demonstrate that we do not intend to raise our tariff walls to prohibitive heights when our debtors begin to repay us in goods and services, which is the only practical way they can pay us. Otherwise our loans will become losses.

If the United States is to meet even the minimum requirements of world rehabilitation, Congress eventually must authorize more advances than those to Greece and Turkey. The $400 million for those two countries will not do the over-all job of political and economic defense which we have begun. A minimum of $5 billion, if promptly and wisely applied in eight to ten countries, might suffice. BUT this $5 billion will be on top of approximately $16.8 billion which we have spent or earmarked during the past two years for use abroad, including our full share of the World Bank and Fund. We shall do a faster and more effective job if Congress will thus add up the foreseeable total of our international aid, and, even though the total looks imposingly large, commit us to it, with proper collateral safeguards from the debtor nations.

Congress need not try to foretell all contingencies, like last winter's weather in Britain, and it certainly should not create the impression that nations need only ask for billions to receive them. On the other hand, the war should have taught us the miserable consequences of "too little and too late." The President should have learned that he engenders skepticism by going to Congress with parts of a program, as he has done in the British, Grecian and Turkish loans. Within the limits of our capacity, we must make the decision now to see the whole job through—or throw in the sponge.

In the interest of the debtor nations—as well as in our own interest—the loan program should be hard-boiled. Rehabilitation loans must really rehabilitate. They must produce a state of economic health which will permit the World Bank and private capital to take over the task of financing world recovery—as perhaps can be done today in France and the Low Countries.

The loans, therefore, must be within the limits of our technical and managerial ability to implement them. Without technical help, Greece can not use its loan effectively—to rebuild railroads, clear ports, revive agriculture. Without skilled supervisors, Germany can not be made to pay its way. Money alone won't pull China from the brink of economic chaos.

Our lending calls for more than money. It calls for trained personnel to help the recipients utilize the loans effectively—geologists, construction and sanitary engineers, monetary experts, and management and agricultural specialists.

Loans are necessary but they are only a first step. A long-range program requires the opening of the half-closed doors of world trade—our own door, too.

We will have to get used to the idea that, when our debtors pay us, they must pay us largely in goods and services. Refusal to permit such repayments in the twenties helped start the world depression in the thirties—and the loss of our investments. *Imports do tend to raise living standards, and a two-way trade program need not require us to slash our present tariff rates.*

The complexion of our foreign trade has changed since the war. Our manufacturing capacity has increased and our raw-material self-sufficiency is tending to decline. For example, we probably shall have to continue importing copper and zinc and to increase our prewar dependence on imported lead. We may soon have to depend heavily on imported oil, and—gradually—on a growing volume of iron ore from abroad. Our normal dependence on imports for commodities like rubber, tin and silk will continue.

Our population has gone up 10 million in the last decade, and we now have a $176 billion national income, making room for more imports.

As a result of every nation's recent attempts to make itself secure and self-sufficient by slamming its trade door, a world-wide series of quotas and restrictions is blocking international trade. Even more, government buying and selling threaten to take commerce out of the hands of private traders, placing it in the uninspired care of bureaucratic negotiators.

Our government has taken the lead in calling the conference of 18 nations, now meeting at Geneva, to open as many trade doors as possible. The American delegates will bargain product by product and country by country—all summer, if necessary—for lower tariffs, fewer quotas and a free flow of *private* trade. The task is a long one, and the results are as yet uncertain, but, if success is achieved, an immense opportunity for good works and good earnings will lie before American businessmen.

This is no picayunish opportunity. Authoritative estimates put our 1947 exports at $11 billion and our imports at $6 billion. That's substantial. It is greater than the value of all crops grown on our farms ($10½ billion) and exceeds the value of all shipments of industries such as automobiles ($9 billion), textiles ($8 billion) and chemicals ($8 billion).

International trade is vital, not to be shrugged off, not to be kicked around as a football of party politics. Republicans and Democrats agree on a non-partisan foreign *political* policy. They should agree also on a non-partisan foreign *economic* policy. The foreign relations of the United States, political or economic, can no longer be log-rolled hither and yon.

A general program for international recovery, outlined here, will bring its full quota of aches and pains. But lack of a program will produce economic and political troubles on a vast scale; timid retreat will invite economic disaster and war.

By an intelligent, bold and resourceful program, we have a chance to win through to a long peace in the kind of world we want. *Unless America provides the leadership, there can be no such program.* Then Communism merely needs to hang around long enough to pick up the pieces.

Ours is the responsibility and the opportunity.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

A NEW ENTERPRISE

Advocacy by the McGraw-Hill Publishing Company, in the accompanying editorial, of an effective world economic policy is not a mere verbal exercise. In the faith that we as a nation shall develop such a policy, this Company, following a trail blazed by leaders in American industry and finance, is expanding its operations overseas.

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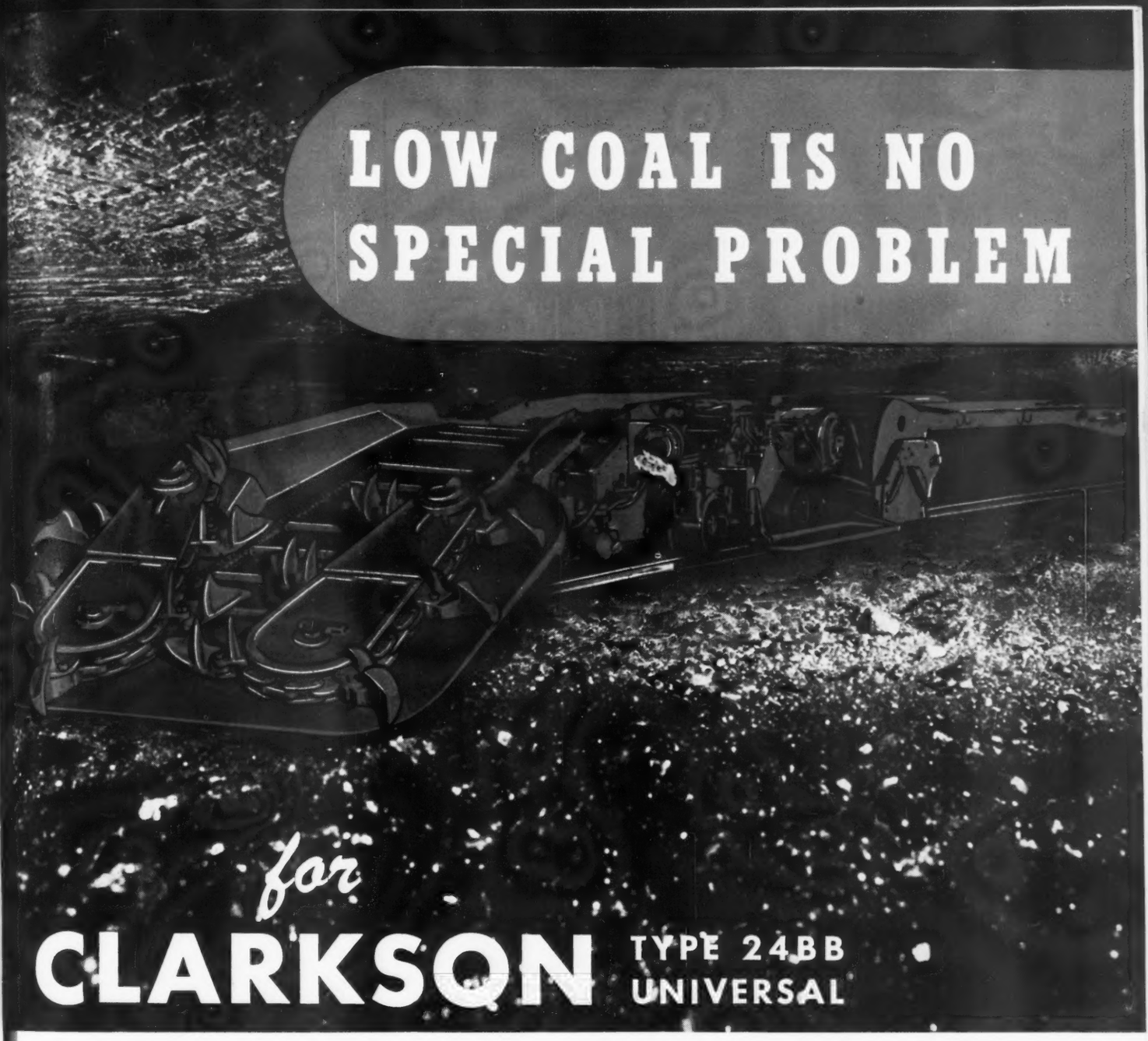

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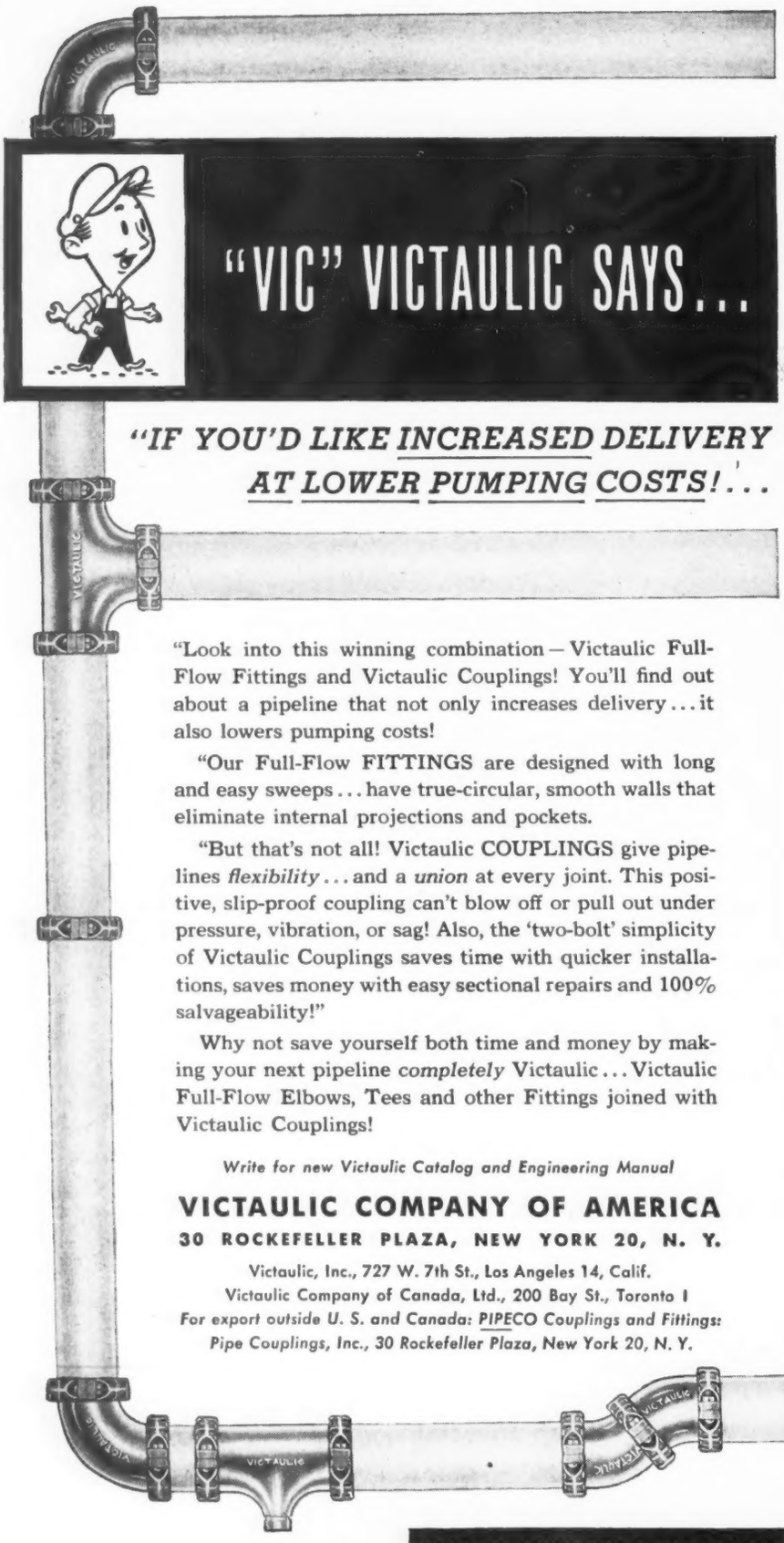
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man Creek was sold to the Aldredge Land Co. last year.

•

Supply Crew 11 Years Without Accident

S. J. Chewning, supply foreman, Consolidation Coal Co. (Ky.), Jenkins, Ky., has established what is believed to be an unusual record for safe work in coal mining. His 12-man

S. J. Chewning

crew, which handles all types of supplies and mining machinery, has worked 137 months, more than 11 years, without a single lost-time accident. In fact, during Mr. Chewning's 25 years as a foreman only two lost-time accidents have occurred to men under his supervision.

•

Centralia Blast Caused By Coal-Dust Ignition

Ignition of a flammable cloud of coal dust raised during blasting operations was responsible for the explosion resulting in the death of 111 men at No. 5 mine, Centralia Coal Co., Centralia, Ill., March 25, according to the report of the official U. S. Bureau of Mines investigating committee, issued April 14.

The official investigating committee, which was appointed by Dr. R. R. Sayers, director of the Bureau, in accordance with the Federal Mine Safety Code, was composed of Federal Coal-Mine Inspectors M. J. Ankeny, W. A. Gallagher, F. J. Smith and Frank Perz, and Mining-Explosives Engineer J. S. Malesky, and conducted a separate inquiry on April 2-4. The source of the ignition was held to be the firing of explosives "in a dangerous and non-permissible manner," and the report added that "no evidence was found to indicate that methane was involved in the explosion." The blast originated at the face of 1 West entry and "was strictly a coal-dust explosion," the report stated.

(Continued on page 134)

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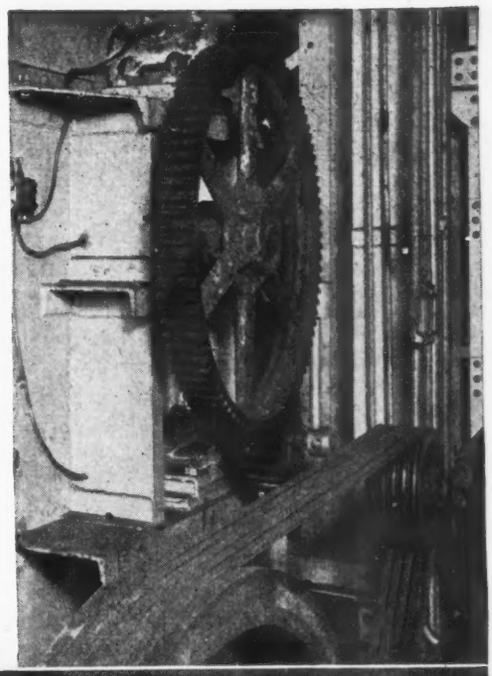

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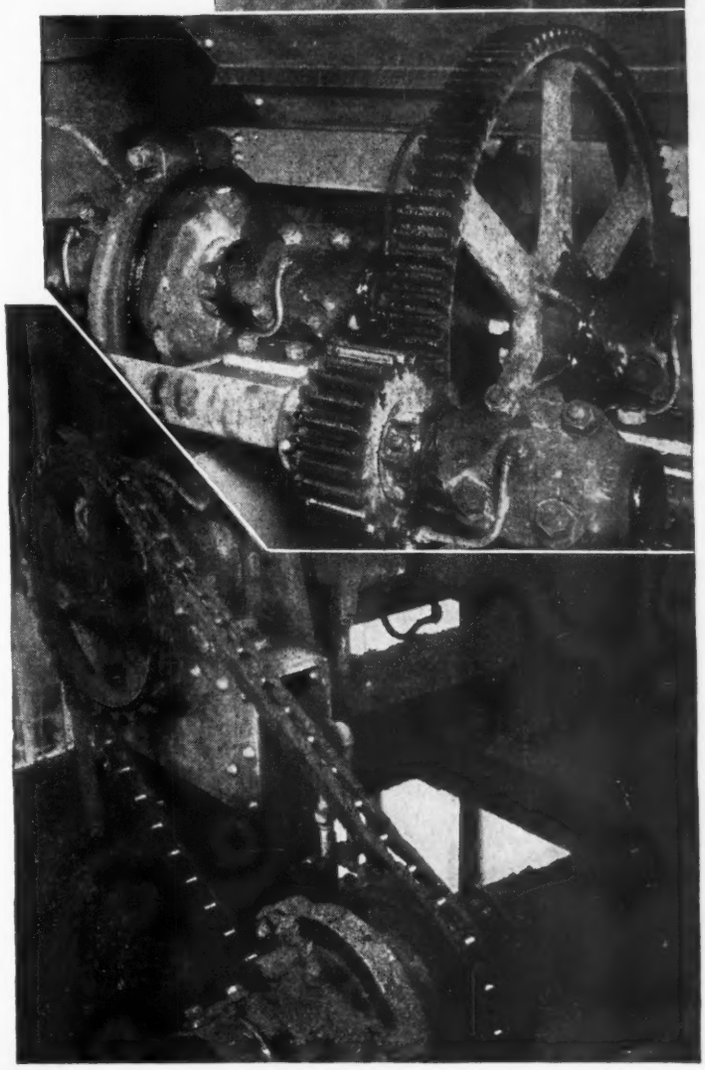

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SPECIFY BIG FIST SHOVELS TO GET THESE EXTRA VALUE FEATURES.

- Moly D Handle with Steel Banded Grip. Grip never loosens, checks or splits.
- Thoroughly seasoned XX Grade handles. Thoroughly sanded and waxed.
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MINERS PREFER BIG FIST SHOVELS BECAUSE

- Flat edge and wide curved flare of blade gets into and under coal.
- Fine Tool Balance lessens fatigue because shovel is easier to work with.
- Over-sized Moly D Handle is comfortable to any hand regardless of size.

THE WOOD SHOVEL AND TOOL CO., Piqua, Ohio

A National Organization Specializing Exclusively in
SHOVELS SPADES SCOOPS

The time of the explosion was fixed at 3:26 p. m. on March 25. Of the 111 men dead in the disaster, 65 were killed by burns and violence, and 46 died from carbon monoxide. One of the gas victims was rescued and later died on the surface. There were 142 men in the mine at the time of the explosion; 24 men escaped unaided, and 8 men, including the gas victim who died later, were rescued.

Salient facts leading to the determination of the origin and cause of the explosion were summarized by the investigating committee as follows:

1. The mine was dry and dusty and heavy deposits of fine coal dust were present on the roof, ribs, floor, and timbers of all active working sections and of idle and abandoned rooms.

2. Rock dust had not been applied in rooms nor in entries for a considerable distance back from the working faces.

3. Methane in an appreciable amount was not found during recovery operations and only a very small quantity of methane was found in air samples collected in poorly ventilated working faces during the investigation. No evidence was found to indicate that methane was involved in the explosion.

4. The explosion occurred at the end of the shift after all face operations had ceased, except for blasting operations. Blasting was the only operation in progress capable of raising an ignitable dust cloud at the time the explosion occurred.

5. Permissible explosives were fired in a non-permissible manner because they were fired with blasting caps and fuse, and coal dust was being used for stemming.

6. Major forces of the explosion radiated from the face workings of 1 West entry in all directions toward open workings.

7. Flame from the explosion died away rapidly upon reaching rock-dusted zones in entries and upon reaching old abandoned workings in which falls of roof covered up much of the coal dust which was left by the mining operations.

8. The only working place in which there was definite evidence of force traveling outby in the area between the face and the last open crosscut was the face of 1 West entry.

9. There was definite evidence of radiation of forces to the north, south, and east at the junction of 1 West and the last open crosscut to the right and left.

In summarizing "lessons to be learned" from the Centralia disaster to prevent the recurrence of coal-dust explosions, the investigating committee advanced the following:

1. The outstanding lesson to be learned is that the mines which liberate little or no methane are not immune from widespread and tragic explosions if dry and dusty conditions exist therein and adequate measures

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ASHLAND PERMATREAT:

- ☐ DUSTPROOFS
- ☐ HAS PERMANENT EFFECT
- ☐ IS ODORLESS TREATMENT
- ☐ FREEZEPROOFS
- ☐ CUTS WINDAGE LOSS
- ☐ GIVES BETTER STOKER FEED
- ☐ HAS NO CORROSIVE ACTION
- ☐ IS EASILY ACCESSIBLE
- ☐ HELPS SALES

Use

Ashland

PERMATREAT COAL SPRAY

Oil treated coal has greater sales appeal. Dealers, industrial users and home consumers, everyone who handles it, appreciates the permanent dust-proofing which PERMATREAT COAL SPRAY provides.

Check the other points listed above. Everyone is an advantage all along the way from mine to dealer, to consumer. All of them add new value to your products. The consumer is ready and willing to pay a few cents more per ton for cleaner, dust-proof coal that handles better, burns better and protects premises from dust and dirt.

PERMATREAT COAL SPRAY is applied with a minimum of equipment. Installation is simple and trouble-free. A portable Dust-Index laboratory will be brought to your mine to determine the most effective treatment for your coals. Write Coal Spray Division today.

Ashland PERMATREAT COAL SPRAY

ASHLAND OIL & REFINING COMPANY

ASHLAND, KENTUCKY

That is the estimate of water pumped for each ton of coal hoisted from underground mines in the entire anthracite region. In bituminous mines, pumps play an equally important role.

It goes without saying that dependable, long life, trouble-free pumps are necessary for profitable mining operation.

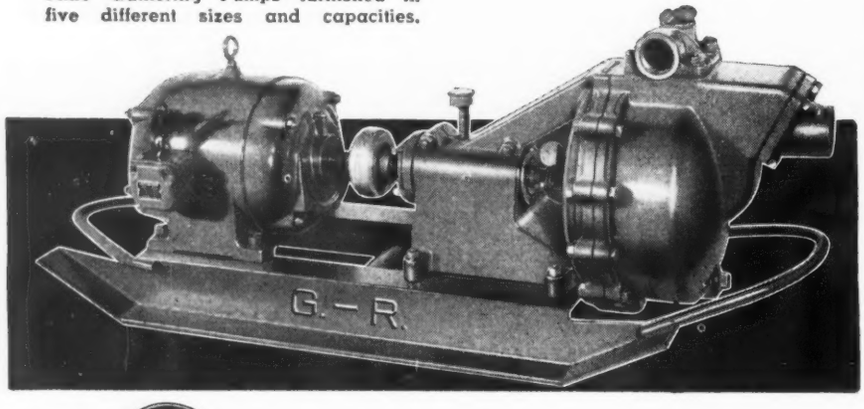
For insuring uninterrupted mining operations Gorman-Rupp Centrifugal Gathering Pumps, designed especially for mine use, are a wise choice.

- They will operate 24 hours a day for months at a time without a rest.
- Completely self-priming -- start, run and stop -- they require no attention.
- Non-Clogging -- will handle any muck or solids that will pass the intake strainer.
- Outstanding in their simplicity of design, only one moving part -- the impeller.

Compare their weight, size, cost or operating expense and you will find Gorman-Rupp centrifugal pumps to be the most all around effective mine gathering pump on the market.

Gorman-Rupp centrifugal mine pumps are made in 5 sizes to meet any requirement. Write for bulletin No. 301-46 or contact your nearest distributor.

Gorman-Rupp Model 9263 Mine Pump on skid base with motor attached. Mine Gathering Pumps furnished in five different sizes and capacities.



THE GORMAN-RUPP COMPANY

306 BOWMAN STREET, MANSFIELD OHIO

Distributed by: Guyan Machinery Co., Logan W. Va. — Weinman Pump & Supply Co., Pittsburgh, Pa. — McComb Supply Co., Harlan, Ky. — Bittenbender Co., Scranton, Pa. — Industrial Supply Co., Terre Haute, Ind. — Hoe Supply Co., Christopher, Ill. — Central Supply Co., Greenville, Ky. — Ebbert & Kirkman Co., Inc., Birmingham, Ala. — Henszey Co., Watertown, Wisc. — Union Supply Co., Denver Colo. — Mill & Mine Supply Co., Birmingham, Ala.

are not taken to control the dust hazard.

2. The explosion has forcefully demonstrated the need to re-evaluate the dust-explosion hazard. If explosions of this type are to be prevented, it will be necessary to regard dry and dusty conditions in mines as being imminently dangerous in the future, and to withdraw the men from the mine or portion thereof where such dangerous conditions exist, until appropriate measures have been taken to remedy such conditions.

3. The partial rock dusting of mines as a remedy for the coal-dust explosion hazard leads to a false sense of security. The spread of dust explosions from one working place to another will be prevented by means of rock dusting only when rock dust is applied to all working places up to and including the last open crosscuts. The application of rock dust along haulage entries in this mine prevented the propagation of flame to the shaft bottom and probably saved the lives of 31 men.

4. Permissible explosives, charged and fired in a permissible manner, are safe explosives. Permissible explosives stemmed with coal dust and fired with fuse and blasting caps in dependent sequence are dangerous. The maximum safety will be obtained, however, when all shots are fired while all men except shot firers are out of the mine.

5. Evidence obtained during the recovery operations showed without doubt that the men working at the farthest part of the mine from the section in which the explosion originated had an excellent opportunity to protect themselves from afterdamp if they had had any knowledge whatever of barricading.

The investigating committee also offered 18 specific recommendations for compliance with the Federal Mine Safety Code. These suggestions were limited to conditions as they relate to explosion hazards because proposals concerning the safe operation of the mine had been made in reports of previous Federal inspections.

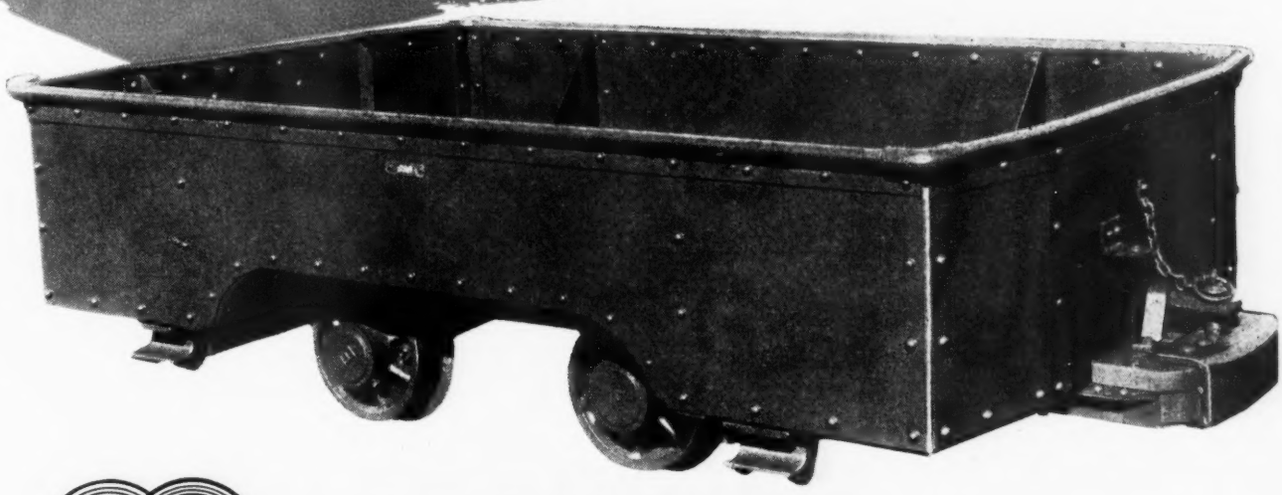
Detailed recommendations included the approved firing of permissible explosives electrically by permissible shot-firing units; prompt firing of charged boreholes; examinations for gas before and after each shot in on-shift blasting; adoption of a split system of ventilation and circulation of sufficient air through last-entry crosscuts; tests for explosive gas not more than four hours before the start of each shift and frequently on-shift; allaying of coal dust with water and application of rock dust in sufficient quantity to maintain the incombustible content of the mine dust to at least 65 percent; removal of coal-dust accumulations; wearing of permissible electric cap lamps for portable illumination underground; and prohibition of smoking or the carrying of matches or other flame-making devices underground.

Control Counts

Every Pitch Hits the Mark with Enterprise Performance Tested Mine Cars

A pitcher's control is the best test of his performance ability. There's a performance test for mine cars, too. Every Enterprise car must stand up to punishment under the most rigid conditions. That's why Enterprise cars give you trouble-free performance that means dollars in the bank.

Enterprise cars are built to meet your particular problem . . . to operate with mechanical or hand loading, in any headroom. Let us help you reach the production figure you've set for this year. Call on our engineers for specific designs to fill your requirements.



ENTERPRISE

Wheel and Car Corporation

MINING AND INDUSTRIAL EQUIPMENT

Bristol, Virginia - Tennessee • Huntington, West Virginia

53% More Fire-Fighting Power

with the NEW Ansul-Dugas Dry Chemical Fire Extinguisher

Engineered to provide 53% more and faster fire-stopping power, the NEW Ansul-Dugas Fire Extinguisher is ready to use—IN A FLASH—on Class B and C fires. The wide heat-shielding stream of Ansul Plus-Fifty Dry Chemical from the specially designed nozzle makes extinguishing more certain even by inexperienced employees.

STOP FIRE FASTER!

HERE ARE OTHER PLUS FEATURES

- Quicker, easier, on-the-spot recharge right after use.
- Highest Rating for SPEED and EFFECTIVENESS as determined by impartial authority.*
- New, wider coverage type nozzle with long range effectiveness.
- Greater fire-fighting power pound for pound, dollar for dollar.
- Increased fire-fighting capacity without increased weight.
- Engineered to resist corrosion.
- Ansul Plus-Fifty Dry Chemical is non-toxic, non-abrasive, non-corrosive.

*Write for charts based on authoritative data of comparative ratings as determined by a national approval agency.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

Long Branch Mine Closes After 34 Years

The Long Branch (W. Va.) mine of the Eastern Gas & Fuel Associates Coal Division, ceased operation March 31, after 34 years of continuous operation during which mule-haulage and hand loading gave way to mechanical methods. The 175 employees have been offered jobs at the company's other operations, but it is understood that many will remain in the community as most of the men own their own homes.

The oldest employee of the mine in length of service is reported to be Dock Lively, who worked with the engineers in 1911 preparatory to its opening. In addition to being the only original employee of the mine still on the job, Mr. Lively boasts a record of no lost-time accidents during the entire period.

•

Standard Anthracite Sizes Proposed by State Bill

A bill calling for the establishment of standard anthracite sizes and a penalty for the sale or marketing of coal that is not in conformity was proposed in the Pennsylvania House March 27 by Rep. William J. Stonier (R., Lack.). In addition to setting up definite measures for the different sizes, the bill would regulate the ash and slate content and require both dealers and operators to keep records of coal sold. Dealers marketing coal as standard that fails to meet specifications would be subject to $300 fine or 20-day imprisonment for the first offense and $1,000 fine or six months for additional violations.

Rep. Harold E. Flack (R., Luzerne) has introduced safety legislation requiring cessation of anthracite mining 100 ft. from abandoned mines that are inaccessible to state mine inspectors. The bill, designed to cut down mine explosions, was said to have been requested by the state mines department. Rep. Flack also offered legislation requiring weekly inspections of underground workings believed to be approaching gaseous areas.

•

Sale of Entire Town Follows Mine Closing

Sale of the entire town of Fireco, Raleigh County, W. Va., including 62 dwellings, a store, theatre and other buildings, to the Lilly Land Co. was announced last month by the Leckie Fire Creek Co. The new owner will place the property on sale within 30 days and it was understood that present occupants will have first choice.

The Fireco mine, which has been in continuous operation since 1916 and produced 2,000 tons daily at its peak, recently had been operating at a reduced scale and its closing was announced April 6 by H. P. Wilson, superintendent.

For better piping Every Time get Everything from Crane

Power . . . process . . . or general service piping . . . you're off to a good start and good finish on every installation when Crane is your partner. You get everything from one source . . . valves, fittings, pipe, fabricated assemblies, and accessories . . . with the quality you want in every last item. From design to erection, the whole job is simplified.

Plants in every industry gain wide benefits by standardizing on the complete Crane line. It removes any question of piping performance; helps to stabilize maintenance costs. On new installations or replacements, it assures this 3-way advantage:

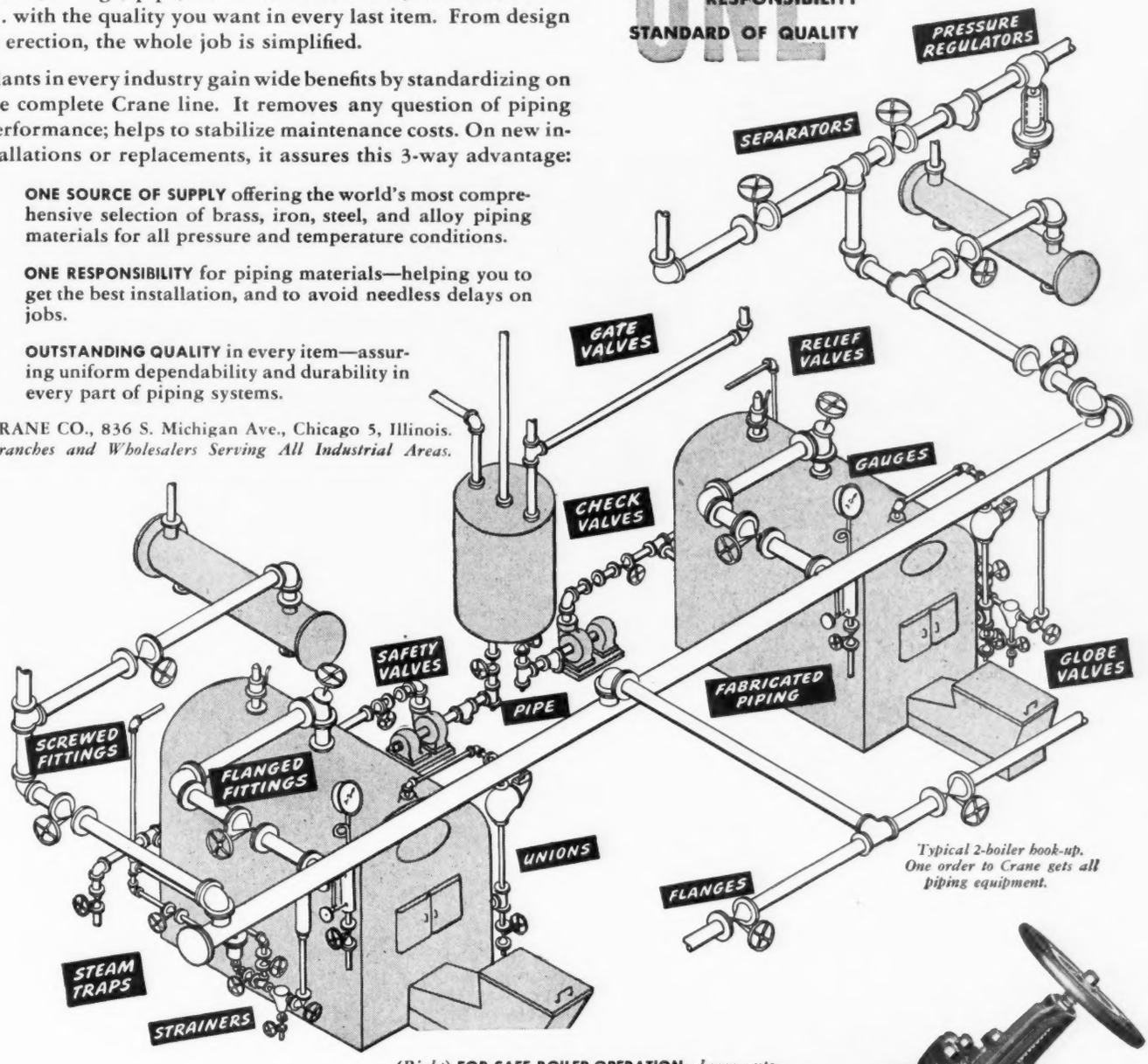
ONE SOURCE OF SUPPLY offering the world's most comprehensive selection of brass, iron, steel, and alloy piping materials for all pressure and temperature conditions.

ONE RESPONSIBILITY for piping materials—helping you to get the best installation, and to avoid needless delays on jobs.

OUTSTANDING QUALITY in every item—assuring uniform dependability and durability in every part of piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Illinois.
Branches and Wholesalers Serving All Industrial Areas.

ONE
SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



Typical 2-boiler hook-up. One order to Crane gets all piping equipment.

(Right) **FOR SAFE BOILER OPERATION,** *choose automatic stop-check valves with a proved performance record. In iron or steel, Crane offers the exact type and size you need. For steam pressures up to 250 Pounds, 450 Deg. F. maximum, Crane recommends this Ferrosteel pattern, angle or straight-way, usable in two positions. Sizes up to 10 in. See your Crane Catalog.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

Starts Here . . .

It's time to take active protective measures against the explosions and mine fires which often result from faults in your electrical distribution system. And, mine sectionalization, utilizing the I-T-E Type KSC Automatic Reclosing Circuit Breaker, provides a logical starting point.

At the first sign of danger from electrical disturbances in mine trolley wires or feeder circuits, the KSC goes into action. It automatically opens, and remains open, until danger passes and line conditions return to normal. Then, it automatically recloses to continue normal operations.

Properly applied in mechanized mines, the Circuit Breaker protects electrical feeders and equipment in each section—isolates the effected area and prevents trouble in one section from penalizing others.

You can get complete details on this equipment by writing for Bulletin 4611 to I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

Be Wise . . .

SECTIONALIZE

Assure maximum protection for your electrical system with the I-T-E Type KSC Circuit Breaker—the breaker with the *automatic reclosing* feature.

Examine the KSC, talk protection with our engineers—when you visit our Booth No. 1303 at the American Mining Congress Show in Cleveland, May 12–15,1947.

I-T-E **SECTIONALIZING SWITCHGEAR**

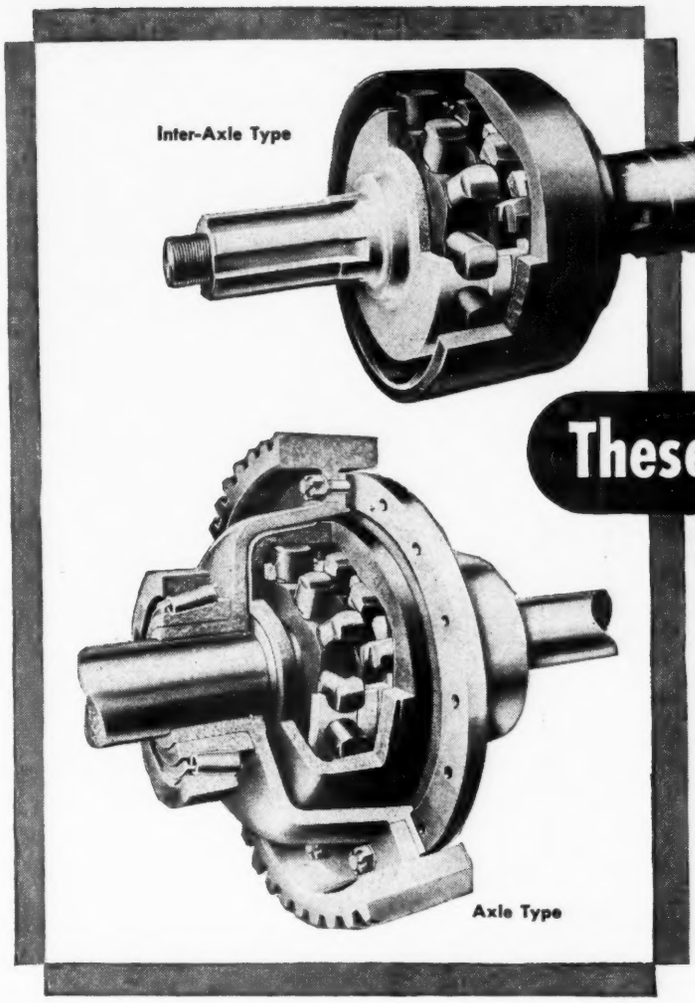
LONDON—Great Britain continued on the road to recovery last month with an increase in industrial coal allotment from 33 1/3 to 50 percent of normal announced April 10. While this figure was in effect before the February crisis, actually the allotments were not always fulfilled. The new increase is guaranteed and a further boost is anticipated May 31.

British coal production is expected by some authorities to reach a record rate by mid-summer so that the government's goal of 200,000,000 tons for 1947 will be reached. For one thing the number of miners at work has taken an upward turn and, for the first time in many years, the total exceeds 700,000. Miners employed were reported to have increased from 692,000 at Christmas to 706,807 in early April and the total is expected to reach 710,000 by May 1. While some government officials fear that the changeover to a 5-day week on May 5 may result in a loss of coal, the union and the miners have pledged that they will mine more coal than is now obtained in the present 6-day week.

GERMANY—More than 300,000 miners in the Ruhr district staged a one-day strike April 3 to protest food shortages. They were joined by miners in the Aachen district, and the total loss of coal from the one-day stoppage and other slowdowns in the area was expected to reach 500,000 tons.

A tri-power agreement signed by the United States, France and Great Britain, under which France will receive greater amounts of coal from the Ruhr and Saar districts as production rises, was announced April 21. Under the plan, which is for six months, France by the end of the year would be receiving 372,000 tons a month if there were no strikes or other setbacks, as compared with the March allotment of 230,000. The French, however, maintain that this still is not sufficient for their reconstruction.

MOSCOW—Among more than 60 designs for coal mining machines submitted in a contest was a combination cutting, crushing and loading machine that can replace 30 miners, according to a recent announcement in the press. The machine, which is said to be completely automatic in cutting and loading the coal, reportedly is to be put into production immediately, with 300 in operation by 1950.



These lick tough terrain...

These are the two types of the Mack Power Divider...another exclusive Mack development...the best way yet devised for preserving traction on slippery ground.

Positive traction with true differential action is assured by the Mack Power Divider. It contains no gears. It exerts no end-thrust. It is designed to transmit more torque to wheels maintaining traction...less torque to slipping wheels.

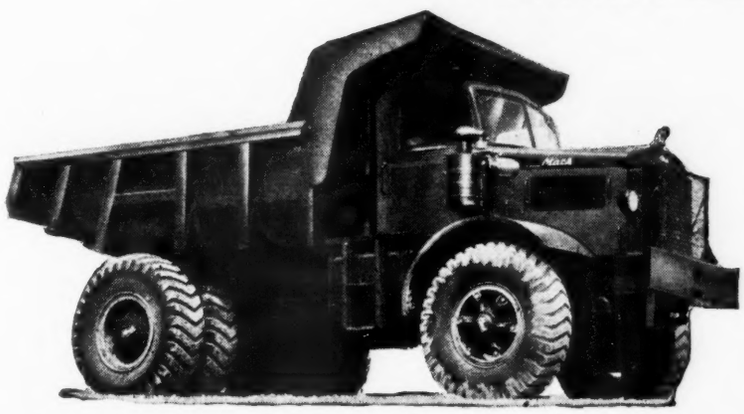
Serving as a third differential, the Inter-Axle type is used in all Mack four-wheel drive bogies for six-wheelers. It is a means of dividing power between the driving axles. This allows speed differences between the axles and makes up for unevenness in road or tires.

In either four- or six-wheel Macks for off-highway service, the Axle-type replaces the conventional differential, with which it is interchangeable.

The Power Divider is another example of how Mack designs and builds trucks down to basic working parts to meet specific job demands.

Trucks for every purpose

Mack since 1900, America's hardest-working truck



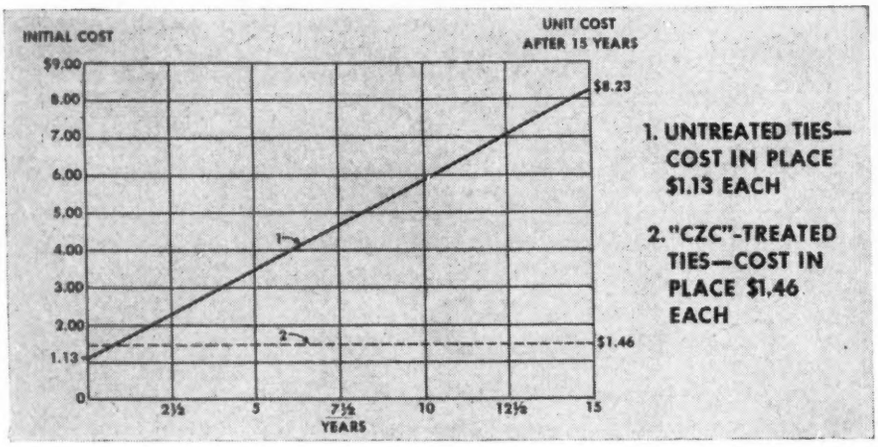
Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada Ltd.

THIS BIG, powerful dumper is one of several Mack models specifically designed and engineered for the tough hauling coal mining operations demand. It has a 15-ton load capacity, nothing of similar size can handle as much wor' in a day!

"CZC"-

TREATED TIES COST LESS!

Compare the costs of treated and untreated ties over a period of 15 years!



The Chart Above shows why it pays to use "CZC"–treated ties and timbers. Figure it out:

Assume an initial cost of 89¢ each for "CZC"–treated ties, and the initial cost of an untreated tie at 56¢. Total cost of installing an untreated tie—including delivery underground (estimated at 6¢) and labor cost for placing and spiking (at 51¢)—is $1.13. Using these same figures, the cost of installing a "CZC"–treated tie is $1.46.

Cost of Renewal High

The estimated life expectancy of an untreated tie is 2½ years, and the minimum life of a "CZC"–treated tie is 15 years. Therefore, the original untreated tie plus five renewals may be required to give the same life as a treated tie. The cost of laying a renewal tie, including spiking, removal and disposal of old ties, is estimated at 80¢ each.

Over a 15-year period, the cost of using untreated ties is $8.23 per unit, compared with $1.46 per unit for "CZC"–treated ties. The saving is even bigger if interest charges are applied on the investment.

For details write E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Dept., Wilmington 98, Delaware.

DU PONT CZC

Chromated Zinc Chloride

WOOD PRESERVATIVE

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

Missouri House Gets Strip Control Bill

A bill calling for a 5c. per ton tax on all strip-mine coal and appointment of five-man county boards that could require leveling of strippings was recently introduced into the Missouri House. Three of the board members in each county would be resident land owners appointed by county judges and would be paid on a $5 per diem basis. The other members would be the county surveyor and county extension agent.

•

Plane Seeds Strippings In Ohio and Indiana

The seeding by airplane of 1,000 acres of strip lands in Harrison, Belmont and Jefferson Counties, Ohio, recently was reported in what was thought to be the first use of the method in Ohio. Some 800 acres of land owned by the Hanna Coal Co., and 200 acres of land at the Betsey mine of the Jefferson Co. were to be seeded for cover crops.

Use of a plane also was understood to be planned by the Ayrshire Collieries Corp. in the seeding of 200 acres near Clinton, Ind., for pasture purposes. Cost of seeding by airplane was reported by the company at 50c. per acre as compared with that of $1 per acre by hand.

•

1944 Bituminous Profit Averages 6.6c per ton

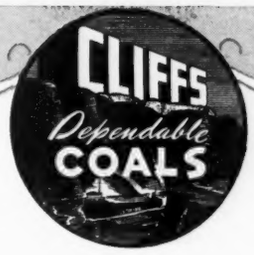
An over-all profit after federal taxes of $40,942,000, or an average of 6.6c. per ton, was made by 1,755 reporting bituminous coal companies in 1944, the most productive year in the industry's history, according to a recent analysis by the National Coal Association on the basis of U. S. Treasury figures. The 1,755 reporting companies paid $48,926,000 in federal taxes, almost $8,000,000 more than was achieved in net profit. Federal taxes that year averaged 7.9c. per ton of bituminous coal mined by the 1,755 reporting companies.

Of the 1,755 reporting companies, 652 reported no net income for that record production year and sustained an aggregate deficit of $8,378,000. The 932 reporting companies showing a profit had an aggregate net income of $98,246,000 before federal taxes.

•

Kittanning Group Sets High Safety Mark

Member mines in the Kittanning (Pa.) Safety Council mined 1,808,197 tons of coal per fatality in 1946, practically double the Pennsylvania State average of 926,000 tons, Roy C. Estep, federal coal mine inspector and chairman of the Council, pointed out at



WE ARE JUST ABOUT FED UP to the point of rebellion on the vast amount of silly chatter that is being broadcast by papers, magazines and public speakers concerning the industry in which we make our living. Apologies! Evasions! Explanations! Always on the defensive. We can see no reason nor excuse for such an attitude and don't propose to share in it any longer.

"The coal industry needs no apologies!

"Certainly coal is expanded beyond its peacetime bounds; certainly its standards of excellence in performance have been lowered by this tremendous expansion; certainly some retraction in production and improvement in methods and products are required and are actually in process.

"But—this very expansion about which so many people are crabbing and apologizing is *the* expansion which made possible the winning of the war—the war that *had* to be won. This expansion of coal production was the No. 1 miracle of modern industry during the war and without its having been done no one of the many other wartime miracles, including the building of the world's mightiest army and navy, could have been accomplished.

"That's point one.

"Point two is that all this tremendous expansion to provide for the greatest power load in history; this replacement of millions of barrels of oil to release said oil for other uses; this replacement of millions of cords of wood for home heating; this multiplication of demand with which to feed the smelters, the furnaces, the shipyards, the fabricating and processing plants which armed and fed and clothed the fighting forces of half the world; this *winning* of the *war,* if you please, was done without the expenditure of even one thin dime in financial grants from any government source. No multi-million dollar plants were built by the government for coal producers —and later sold to said producers for a fraction of their worth. No multi-million dollar loans, no subsidies; no tax exemptions; no *nothing* but work, work, work!

"That's point two.

"Point three is that, as compared with other industries coal is not doing such a bad job, *today*. True, some off-grade product is still reaching consumers; some deficiencies are still evident in preparation. But you *can get coal!* How about automobiles? How about carpets? How about lumber? How about metals? How about white shirts? And how about prices in coal and other industries? No one has ever yet had to pay a white shirt price or a lumber price or an automobile price for a ton of coal.

"That's point three.

"Point four is that the coal industry is doing much to accelerate its return to supremacy as the primary source of heat-energy. Hundreds of thousands of dollars are going into research, through Bituminous Coal, Inc., the Locomotive Development Committee, Battelle Institute and other scientific channels, and into marketing development through Home Heating Service, Inc., Better Home Heating, Inc., and other outlets. The industry —as an industry—is not retrograding; it is not stagnant. It is moving ahead.

"That's point four.

"And point five is a wholly different one. It is the American Coal Miners; the most efficient, highly skilled and highly paid body of men in similar work in the whole world. Loafers? Yes, a mighty few of them. Drunks? Hardly, or they couldn't work in underground pits. Trouble makers? Few of them. After all, no other industry had a better work record during the war, when ninety per cent of the normal number of miners produced 110 per cent; 120 per cent; yes, 150 per cent of the normal volume of coal.

"Let's repeat it; we are proud of coal. Proud of the product, the men who dig it and the efficiency of its performance. It still has a long road to travel back to normal, but it is on that road and is traveling fast—a lot faster than some of these government subsidized war babies that number in their midst some of the most severe critics of coal. We, in coal, have all got to pull together like we never pulled before. If we have any energy left over while we are pulling, let's use it to brag and boast a bit about the greatest industry on earth—America's coal industry. And, above all, let's stop crabbing; stop apologizing and begin tooting our own horn."

THE CLEVELAND-CLIFFS IRON COMPANY • CLEVELAND, OHIO

CHICAGO • DETROIT • BUFFALO • CHARLOTTE, N. C. • GREEN BAY, WIS.

THE CLEVELAND-CLIFFS DOCK COMPANY • MINNEAPOLIS

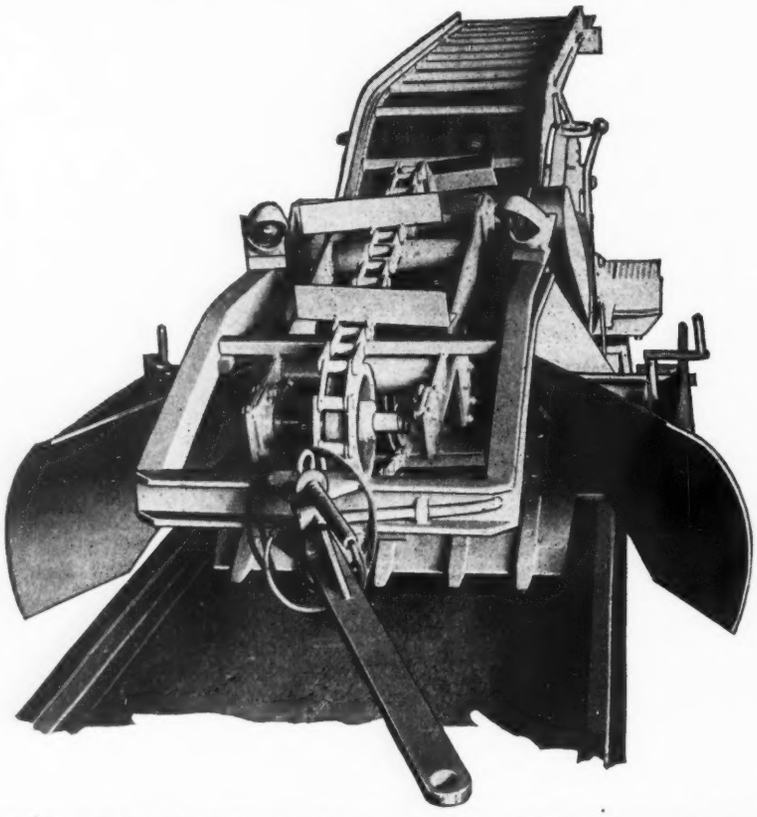
DOCKS AT DULUTH, GREEN BAY AND ESCANABA

PERMISSION TO REPRINT IS HEREBY GRANTED

A ROAD HOG

that roots up the hard dirt between rails and loose gob beyond rails, and

LOADS IT IN CARS



CANTON TRACK CLEANER

Rigidly built to meet the demands for a heavy duty machine. DIGGER PLATE can be raised or lowered with an hydraulic pump. WINGS are adjusted, up or down, in or out independent of each other. FRONT CONVEYOR is of floating type, permitting large rock to be handled. BOOM built to accommodate car size. BOOM CONVEYOR can be raised or lowered. MACHINERY protected with a shear pin. Quickly changed. Standard WINGS clean 48 inches from center of track gauge. Extensions to WINGS permit cleaning greater distance. Pulled by a locomotive. Length 21 ft., Width to conform to haulway. Weight 4,500 lbs.

CAPACITY — ONE TON DIRT PER MINUTE

DOES THE DIRTY WORK WITHOUT COMPLAINT

SEND FOR BULLETIN

SEE IT AT THE COAL SHOW

THE AMERICAN MINE DOOR CO. **CANTON 6, OHIO**
2057 DUEBER AVE.

the second annual banquet March 31. held at the Twentieth Century Club, Kittanning.

Highlight of the evening was presentation of safety banners to the mines in the group making the best safety record during the year. Among the Class A Mines (larger mines), the Mortimer mine, Keystone Mining Co., East Brady, Pa., took first place, having 15 lost-time accidents for a frequency rate of 42.32. In the Class B Mines (smaller operations), the Mohican mine, Allegheny River Mining Co., Kittanning, was the winner, with 5 lost-time accidents and a rate of 27.39. Neither mine had a fatality during the year. William Robertson accepted the banner for the Mortimer mine and Clyde Crooks that for the Mohican mine. The dinner was followed by entertainment.

•

Anthracite Booklet Views Industry Economics

A graphic study of the economics of the anthracite industry in booklet form was distributed by the Anthracite Institute last month to all retail dealers and all producing-company sales representatives, totaling more than 10,000. The study, entitled "The Anthracite Industry," was based on material presented by the Institute staff at forum discussions held this winter for some 4,000 supervisory employees of member companies and other interested producing-region groups.

Distribution of the booklet included 8,000 dealers, 1,200 producing-company employees, including 200 sales representatives who received it at meetings conducted in New York, Boston, and Philadelphia, and the 4,000 supervisory employees who attended the Institute forums. These included 500 officers of United Mine Workers locals.

•

Gas-Turbine Topic At Central W. Va. Meet

The gas-turbine locomotive burning powdered coal offers the best possibility of achieving a real cut in railroad fuel costs and for preserving bituminous coal as the dominant railroad fuel, Charles F. Kottcamp, assistant to the director of research of the BCR Locomotive Development Committee, pointed out, April 3, before more than 200 members and guests of the Central West Virginia Coal Mining Institute at its first regular monthly meeting of the year at the Fairmont Hotel, Fairmont, W. Va.

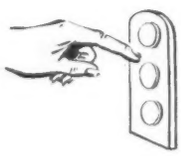
Mr. Kottcamp outlined the $3,000,000 BCR development program to achieve the coal-fired gas turbine locomotive and discussed the latest test data on coal pulverization, fly-ash removal and combustion. Details

PRACTICALLY DUST FREE CUTTING
Goodman Type 512 Shortwall with Bugduster
GOODMAN MANUFACTURING COMPANY • HALSTED STREET AT 48TH • CHICAGO 9, ILLINOIS

I was looking ahead when I bought a 3½ H.P. AIRCOOLED Sheppard Diesel

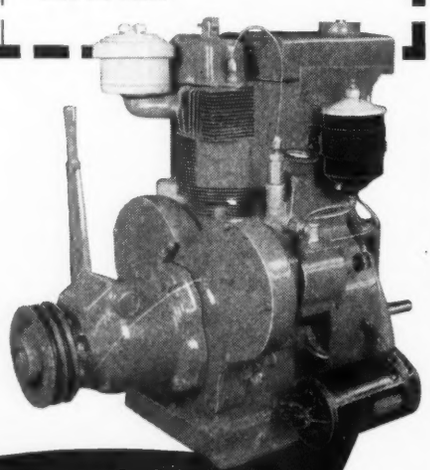
THERE ARE *cheaper engines. But, the rugged little Sheppard will be going strong long after the others would have worn out.*

NO ELECTRICAL IGNITION . . . *no carburetor . . . means a minimum of servicing and lower maintenance costs. Looking ahead over a period of years — that's important.*



BEING A FULL DIESEL, *the Sheppard starts easily and operates efficiently on low-cost domestic furnace oil. It produces no harmful or explosive fumes.*

I LOST *a plant when a spark ignited a fume-filled room. It won't happen again . . . not with the Sheppard on the job. That protection alone more than justifies its cost.*



The model 14 Aircooled Sheppard is available as a power unit or direct connected to a 2,000 watt generator. See it at your nearest Sheppard Distributor. We will forward his name on request. Also literature with complete specifications available.

R. H. SHEPPARD CO., INC.
11 Middle St., Hanover, Pa.

Sheppard DIESEL

DIESEL'S THE POWER . . .
Sheppards' the Diesel

Generating Sets • 2,000 to 36,000 watts
Power Units • 3½ to 56 continuous H. P.

of the two turbines now on order and the method of arranging the coal-handling equipment were described. The first two experimental coal-fired gas turbine locomotives should be on road tests a year hence, said Mr. Kottcamp.

A $25 cash door prize was won by Ernest Philipps of the Christopher Coal Mining Co., Four States, W. Va. Engineers and others from the Baltimore & Ohio and Western Maryland R.R., the Monongahela Power Co., and the Fairmont chapter of the Society of American Professional Engineers were guests of the Institute.

The May meeting is to be held at the Waldo Hotel, Clarksburg, W. Va.

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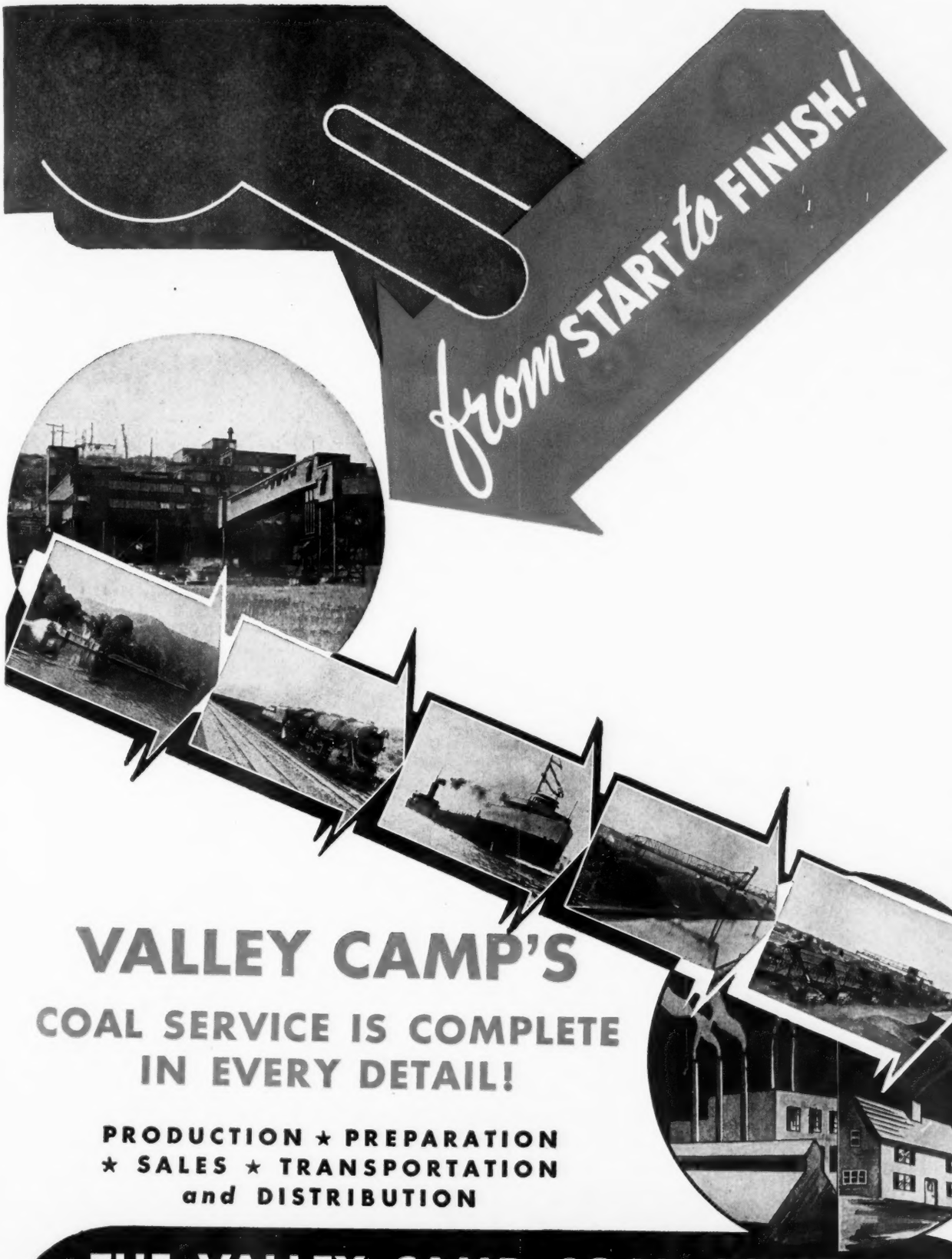
Personal Notes

Extensive changes in operating personnel of the Glen Alden Coal Co., Scranton, Pa., effective April 1, recently were announced. **William W. Everett,** general superintendent since 1943, was named general manager of the organization. Mr. Everett, whose father was a life-long employee of Glen Alden, joined the company after graduation from Penn State College in 1925 and has held many operating positions in the company. **Maurice Williams,** named assistant to the president, joined the Lehigh & Wilkes-Barre Coal Co. in 1907 as a colliery clerk. Since 1930, he has been treasurer of the Lehigh & Wilkes-Barre Corp., in addition to other duties in the Glen Alden organization.

Fred L. Klipple, formerly assistant to the general superintendent, has been promoted to general superintendent, southern division, and **H. Merton Ruth,** previously superintendent, Wanamie colliery, was named general superintendent, northern division. Various promotions in colliery superintendents also were announced: **John B. Davis** was appointed superintendent of the Hollenback, Empire and Stanton collieries, succeeding

William W. Everett



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COAL SERVICE IS COMPLETE IN EVERY DETAIL!

PRODUCTION ★ PREPARATION ★ SALES ★ TRANSPORTATION *and* DISTRIBUTION

THE VALLEY CAMP COAL COMPANY

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WISCONSIN GREAT LAKES COAL & DOCK CO., MILWAUKEE, WIS. • GREAT LAKES COAL & DOCK CO., ST. PAUL, MINN.
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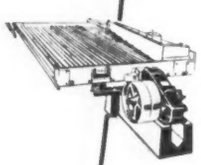
"Excellent Screening"

Under Rugged Conditions

The G. and F. Coal Company of Brazil, Ind., uses a Plat-O Vibrating Screen for cleaning all stoker-size coal produced by its Hickory Mine No. 2. Richard Wegner, in charge of the tipple at this strip mine, says the Plat-O gives excellent service, in spite of rugged conditions resulting from wet coal and winter weather. This Plat-O is equipped with 5/16"x2½" screen, which frees the stoker-size coal of dust and fines. The screen has handled up to 150 tons a day, amounting to about three carloads of stoker coal. It is only one of many Plat-O Screens giving efficient sizing under rugged operating conditions . . . combining large capacity with high screening efficiency.

DEISTER MACHINE COMPANY

Fort Wayne 4, Indiana



MORE COAL MORE PROFIT

Fast, high capacity Plat-O Coal Washing Tables add more marketable coal . . . more profits . . . to your operation. "Fines" that otherwise would be lost are salvaged from your waste piles.

PLAT-O

by DEISTER

Maurice Williams

Daniel J. Thomas, retired. **David J. Joseph** has become superintendent, Huber colliery, replacing **Thomas R. Gambold,** retired, and Mr. Joseph, in turn, has been succeeded as superintendent, Truesdale colliery, by **Norman F. Becker. Joseph L. Reynolds Jr.** has been appointed assistant superintendent, Truesdale colliery, Mr. Becker's former position.

Harold L. Price has been named superintendent, Audenreid colliery. **Harry E. Pearce,** previously superintendent, Lance colliery, has been promoted to superintendent, Wanamie colliery, succeeding Mr. Ruth. **Ralph Hodgson** has become the new superintendent of Lance colliery. **Daniel R. Thomas** has been advanced to assistant superintendent, Woodward Colliery.

R. S. Long, formerly with the Eastern Gas & Fuel Assoc., Coal Division, Mt. Hope, W. Va., has resigned to become a vice president of the Riverton Coal Co., Crown Hill, W. Va.

Rowland E. Powell, previously in the engineering department of the Consolidation Coal Co. (Ky.), has joined the engineering department of the Island Creek Coal Co., Holden, W. Va. At Island Creek's Mine No. 7, Holden, **Graham Stark** has been promoted from electrician to section foreman. **Darl Waybright** has been transferred from Mine No. 16 to Mine No. 7 as section foreman. **Jack Perez** has been advanced from electrician to section foreman at Mine No. 23.

Consolidation Coal Co. (Ky.), Jenkins, Ky., has announced several promotions among operating personnel. At Mine No. 206, **Milford Conley,** formerly trackman and timberman, has been made section foreman. **Denver Plummer,** maintenance repairman, has been appointed assistant maintenance foreman at Mine No. 207, and **W. M. Sanders** has been advanced to dispatcher at that mine. **Jesse Hale,** formerly main-line motorman, has been promoted to dispatcher,

Lubricate in SECONDS--

Instead of Hours

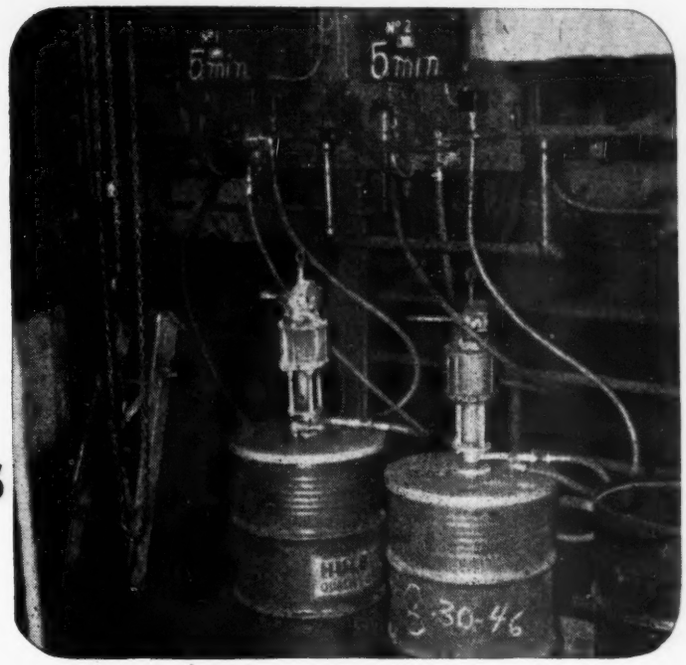
install

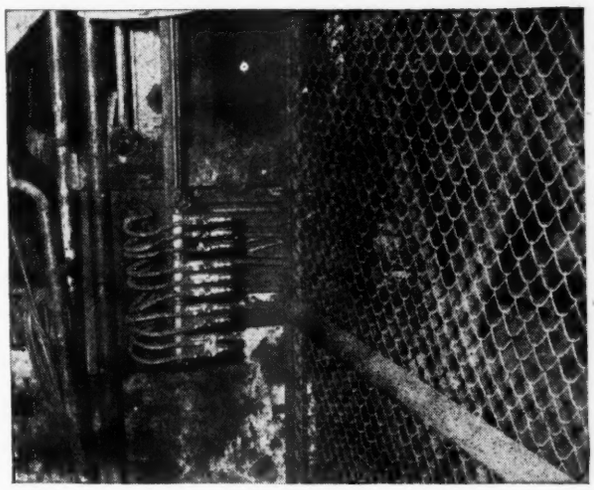
LINCOLN

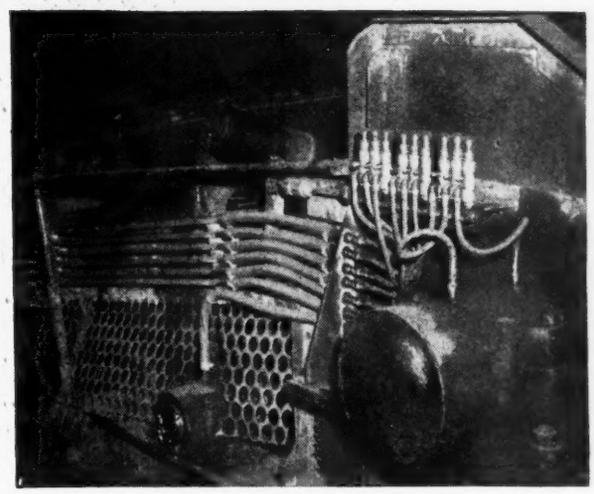
Single line

CENTRO-MATIC* LUBRICATING SYSTEMS

- *Increase Production*
- *Cut Per Ton Cost*







Why risk wasting valuable machine hours and man hours when thorough lubrication can be accomplished in a matter of seconds, without shutting down machines, by installing a Lincoln Centro-Matic Lubricating System.

Lincoln Centro-Matic Systems, the choice of many cost and safety conscious coal mine operators, eliminate hazards, save lubricants, bearings, and increase "Per Ton" Profits.

The photographs above, taken in the cleaning plant of a large eastern operator, illustrate how efficiently Centro-Matic Systems take over the dangerous and difficult task of lubricating coal mining equipment. Photo (1) shows the two Lincoln Air-Motor Operated Pumps which supply lubricant direct from original 55 gallon drums to each of 427 bearings in this plant.

A single supply line leads from the lubricant pump to the injectors. Each injector is individually adjusted so that every bearing receives a measured amount of lubricant. The control panels, mounted above each pump, are equipped with time clocks which can be set to cycle at predetermined intervals ranging from 3 to 60 minutes. An alarm signal gives instant warning if air supply should fail or if lubricant drums are empty. Photos (2) and (3) show a few of the 427 injectors mounted in manifold. The injectors are connected to the bearings by tubing, or where vibrations or movement is present, by flexible high-pressure hose. Almost two million tons of coal have been handled in this plant since the Centro-Matic System was installed and no time has been lost because of bearing failure.

B47-6

*Trade Name Registered U. S. Pat. Off.

Engineering Service

Our lubrication engineers are ready to assist you in solving your lubrication problems. We invite you to make use of this service which is offered without obligation.

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A "PAY-OFF" IDEA
for that next mine entry

Have you heard about ARMCO Tunnel Liner Plates for sloped entry construction? Here's the simplest, most inexpensive way you ever saw to construct better passageways from ground surface to working levels.

These rugged, corrugated liner plates are designed to assure safe strength without excessive bulk or weight. They provide worthwhile durability and safety from fire hazards. One man can easily handle the light-weight steel sections, bolting them together with ordinary wrenches. Costs are low and the job goes fast.

You'll also find that sinking vertical shafts with ARMCO Liner Plates is an easy, economical way to provide additional ventilation and safety as active workings extend from original mine openings. Write for data on Armco's tunneling methods. Armco Drainage & Metal Products, Inc., 2065 Curtis St., Middletown, Ohio.

ARMCO

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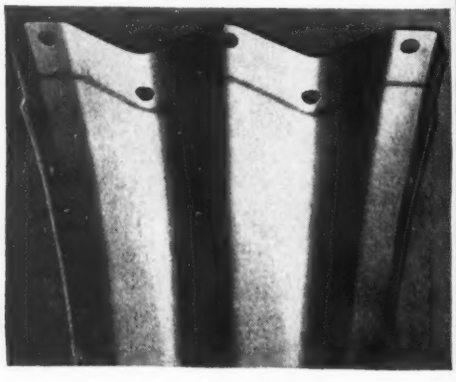
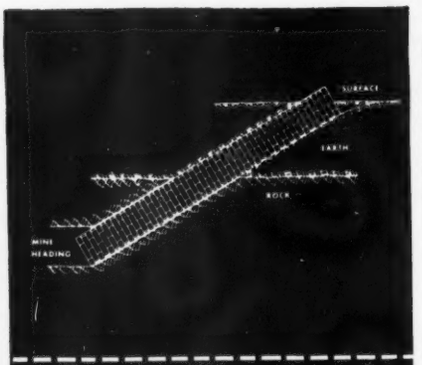
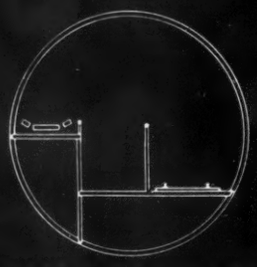
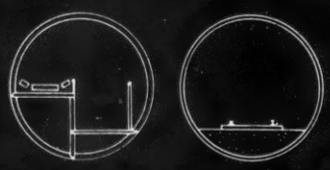
TUNNEL LINER PLATES





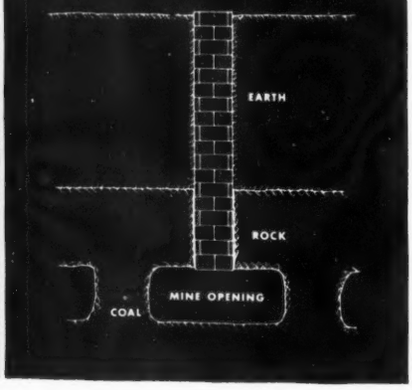


Single large circular opening made with ARMCO Liner Plates contains conveyor, walkway and track.



Building two small openings with ARMCO Plates permits using one for air intake and the other for exhaust. Left—Entry with conveyor and walkway. Right—Entry with tracks.

ARMCO Plates may be used to build single arch-type entry containing conveyor, walkway and track.



and **J. B. Davis**, loader operator, has been made section foreman, at Mine No. 204. At Clover Splint mine, **Fred C. Helton**, maintenance repairman, has been named maintenance foreman. At Mine No. 214, **Willie Stacy** has been promoted to section foreman, **Leland Collins**, maintenance repairman, to assistant maintenance foreman, and **Ernest B. Shockey**, formerly supply clerk, to outside foreman.

W. L. "Bill" Jones, chief clerk, Rockvale No. 3 mine, Colorado Fuel & Iron Corp., Canon City, Colo., retired April 1, after more than 46 years of service with the company. He was honored March 21 at a dinner attended by company officials and fellow employees, at which he was presented with a fishing coat by Homer L. Massey, general auditor.

Joshua Smith, for the past six years general safety inspector, Powellton division, Eastern Gas & Fuel Associates Coal Division, has been named assistant to C. R. Stahl, assistant to the vice president in charge of accident prevention and labor relations. Mr. Smith, who first joined the company in 1929, succeeds **R. S. Long**, who recently resigned to join the Riverton Coal Co. **Griffith V. Jones** has been appointed general mine foreman, Sonman Slope mine, succeeding **Clarence E. Strong**, resigned.

L. W. Roberts, a member of the industrial engineering department of the Island Creek Coal Co., Holden, W. Va., for the past two years, has been named assistant to J. K. Berry, head of the department.

M. Hilliard, formerly associated with the Virginia Mining Co., Mt. Pleasant, Pa., has been named superintendent of the Clearco (W. Va.) strip mine of the Standard Ore & Alloys Corp.

John W. Mackie Jr. has been elected secretary-treasurer of the Clemens Coal Co. and the Mackie-Clemens Fuel Co., Pittsburg, Kan., succeeding the late **Joe Fudge**.

Herman Sydenstricker, of Fayetteville, W. Va., formerly a mine superintendent for The Carbon Fuel Co., has been appointed a West Virginia mines inspector-at-large, with headquarters in Charleston.

Henry Barkran has been appointed a superintendent for the Black Eagle Smokeless Coal Co., Mullens, W. Va.

Mrs. A. L. Barry, president and managing director, Coal Valley Mining Co., Edmonton, Alta., Can., an organization founded by her husband 25 years ago, is reported to have sold the company and to be planning retirement.

Stephen M. Davis has been appointed to the fuels technology staff

It is on the job performance that has won for LIMA shovels, cranes and draglines the universal approval of open-pit miners everywhere. Rugged, unit-type construction for extra strength; long booms and dipper handles for extra reach; long wide crawlers for maximum stability; anti-friction bearings for smooth, efficient operation; independent clutches for simultaneous operation and "Precision" air control for ease of operation. The combined advantages of these features make LIMA the undisputed favorite wherever top quality, big output and low cost operation are desired. Bulletins are available on types and sizes to fit your individual requirements.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division • LIMA, OHIO, U. S. A. • *Offices in Principal Cities*

LIMA SHOVELS CRANES DRAGLINES

CAPACITIES 3/4 YD. TO 5 YDS. . . . 13 TONS TO 100 TONS . . . VARIABLE

A B C SPELLS PROFITABLE VENTILATION IN THE MINE OPERATORS' DICTIONARY

A mine ventilation system does its duty only in proportion to the amount of fresh air that reaches the working zones. ABC products eliminate the waste of fresh air and deliver it in full volume to the men who are working; improving their morale, maintaining their efficiency, and increasing their output. ABC installations have paid for themselves many times over in greater tonnage-per-man.

ABC JUTE BRATTICE CLOTH is the material that has stood the test of time for sealing off dead areas and directing the flow of fresh air to the working faces. Brattices of this rugged fabric have proved effective output boosters in many mines. ABC Brattice Cloth withstands handling and gives long service under mine conditions—it's made that way. Treated with non-injurious chemicals to resist flame, fungi and shrinkage. Available in two grades. Samples are yours for the asking.

MINEVENT TUBING delivers fresh air with no waste to the men who are working. Installation and removal are made easy by MineVent patented couplings and hangers. Made in three grades of tough material that withstands fungi, shrinkage, leakage, and handling.

Take the first step toward more profitable ventilation by writing for ABC samples and literature.

SEE OUR EXHIBIT AMERICAN MINING CONGRESS COAL EXPOSITION SPACE 119, CLEVELAND MAY 12-15.

A B C AMERICAN BRATTICE CLOTH CORP. WARSAW, INDIANA

of Battelle Memorial Institute, Columbus, Ohio.

Robert Girke has resigned as Anthracite Institute field representative in eastern New York and Vermont to join the Schenectady County Coal Co., Schenectady, N. Y., as sales manager.

Charles S. Frost, administrative assistant for the Indianapolis, Ind., air pollution board, has been named smoke commissioner for the City of Roanoke, Va.

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Obituary

Oscar M. Hinton, 64, vice president and comptroller, Berwind-White Coal Mining Co., New York, and a director of many other organizations, died April 5 from injuries sustained when his automobile was struck by a railroad train at a crossing near Keyport, N. J.

Walter C. Shunk, 69, president, Peerless Coal Corp., Glamorgan, Va., died March 26 at the Norton, Va., clinic, following a week's illness. Beginning his career as a boy in the mines at Jenners, Pa., he was later associated with the Consolidation Coal Co., Stonega Coal & Coke Co., and the Goodman Mfg. Co. In 1937 he took over the Glamorgan Coals, Inc., which he reorganized as the Peerless Coal Corp.

John T. Foreman, 52, general superintendent, Stith Coal Co., America, Ala., died suddenly March 28, following a heart attack in his office. A resident of Walker County for 35 years, and associated with the Stith Coal Co. for more than 30 years. Mr. Foreman was regarded as one of the pioneers of coal mining in that section.

Manley Cobb, assistant foreman, Gorgas mine, Alabama Power Co., Gorgas, Ala., died Feb. 15 of injuries sustained in the mine eight days earlier. Mr. Cobb, who had had 18 years' experience underground, joined the Alabama Power Co. in 1942.

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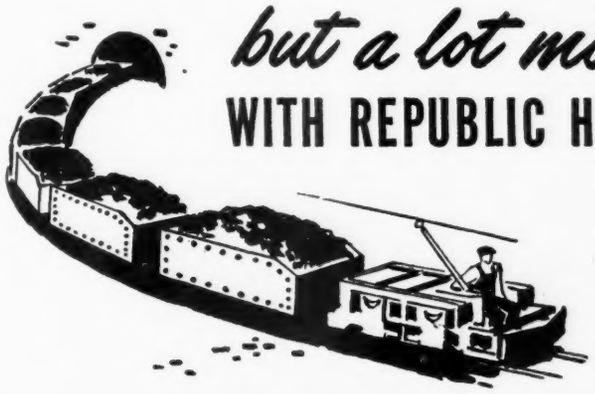
Association Activities

Indiana Coal Producers' Association, at a meeting in Terre Haute, April 8, reelected as president R. H. Sherwood, president, Central Indiana Coal Co., Indianapolis. J. B. F. Melville, vice president and general manager, Ayrshire Collieries Corp., was elected vice president, succeeding F. S. McConnell, president, Enos Coal Mining Co. Directors of the association, in addition to Messrs. Sherwood, Melville, and McConnell, are Hugh B. Lee, vice president and general manager, Maumee Collieries Co.; C. M.

NO MORE WEIGHT...

but a lot more Strength!

WITH REPUBLIC HIGH STRENGTH STEELS



It's difficult to avoid rough handling of cars in modern mechanized mine service. But it is possible to build stronger, more durable cars *without adding weight* by using Republic High Strength Steels.

When applied in the same thickness you now employ for carbon steels, Republic High Strength Steels substantially increase car strength through their yield point of 50,000 pounds—stretch car life through 4 to 6 times the resistance to atmospheric corrosion afforded by carbon steels.

If, however, you are primarily interested in increasing car capacity, you can do that without adding weight by using thinner sections that are just as strong as heavier sections of carbon steel.

Send for Booklet No. 445. It tells the full story of Republic's three *different* high strength steels—Republic ALDECOR, Republic COR-TEN and Republic DOUBLE STRENGTH.

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HIGH STRENGTH STEELS
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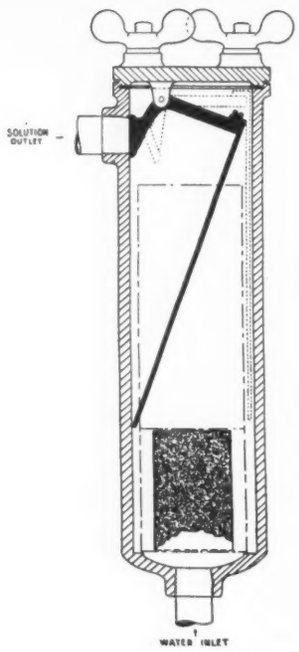
Other Republic Products include Carbon, Alloy and Stainless Steels—Sheets—Plates—Pipe—Bars—Wire—Bolts, Nuts and Rivets

Mine Safety!

COMPOUND M CARTRIDGE for DUST CONTROL



Cartridges packed 12 to the carton.

Patents Pending

Overall height 19"

Overall width 4¾"

Weight 33 lbs.

Positive proportioning, automatically, of time tested Compound M "wetting" compound. The only wetting compound developed specifically for mine use.

Insures complete dust control without pumps, motors, or cumbersome mechanical proportioning units.

Installed in pipe line, water pressure does proportioning and spraying.

Each cartridge makes approximately 1000 gallons of solution.

Effectively controls dust with a minimum of moisture. Recommended by leading authorities for laying dust from coal and all carbonaceous and silicaceous materials; also greatly aids fire fighting with "wet water" penetration.

Ask for details

Our Technical Staff is at your service.

Mining Congress Booth No. 1205

The JOHNSON-MARCH CORP.

Manufacturers of Chemical Products for Mining and Industry

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Smith, secretary-treasurer, G. & F. Corp.; and V. C. Kibler, Blackfoot Coal & Land Corp.

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Coal Publications

Accident Prevention Manual for Industrial Operations. National Safety Council, 20 North Wacker Drive, Chicago 6, 1947. 544 pp., with illustrations, charts and tables; 6x9-in.; imitation leather; price not quoted. Primarily for manufacturing but useful also to non-manufacturing industries. Fourteen major subjects: plant design and layout, construction and demolition, permanent equipment and facilities, guarding and operating machinery, materials handling and storage, electrical hazards, chemical hazards, fire and explosion hazards, flammable liquids, hand and portable power tools, vehicle operation, personal protective equipment, industrial hygiene and safety organizations and programs.

A Course in Electrical Engineering, Vol. II, Alternating Currents (new fourth edition), by Chester L. Dawes. McGraw-Hill Book Co., 330 West 42nd St., New York 18, 1947. 708 pp. plus xxi pp.; 6½x9¼-in.; cloth; $5. Wartime and other developments in electrical engineering since 1934 have been added for this new edition. Basic material is expanded to show in greater detail its application to electrical machinery, apparatus and instruments, and illustrations showing transformers, alternators, induction motors, rectifiers, etc., are up-dated to show modern practices. New information is included on synchronous motors, selsyns, rectifiers, long-line high-voltage transmissions, low-voltage three-phase networks, delta and Y systems and lightning protection. Trigonometric, logarithmic and other tables; questions and problems.

Some Results of Inspections of Explosives-Storage Facilities Under the Federal Explosives Act, by P. R. Mayer. U. S. Bureau of Mines, I. C. 7398. 60 pp.; 8x10½-in.; paper; mimeo.; free. A review of improvements made in storage of explosives since passage of the Federal Explosives Act in 1942, with recommendations for state and municipal laws directed toward safety and security from theft and unauthorized use. Includes a list of U. S. Bureau of Mines publications on storage and use of explosives.

Investigation of Coal Deposits in the Coal Creek District, Gunnison County, Colorado, Progress Report 1, by A. L. Toenges, L. A. Turnbull, J. D. Davis and D. A. Reynolds. U.S. Bureau of Mines, R.I. 4104. 20 pp. plus 1 map; 8x10½-in.; paper; mimeo.; free. Drilling indicates three

AIR COMPRESSOR LUBRICATION

Solving AIR COMPRESSOR TROUBLES

Lubrication Engineer's Report:

"A mining company* in the Joplin area was having trouble with the unloading valve on an Angle Compound Air Compressor. They were also troubled with discharge valve breakage of the high pressure cylinder.

Case No. 1:

"The previous oil was replaced with Cities Service North Star Oil No. 5 and not a single instance of gumming or sticking or trouble of any kind with the unloading valve or discharge valve has been reported in over two years."

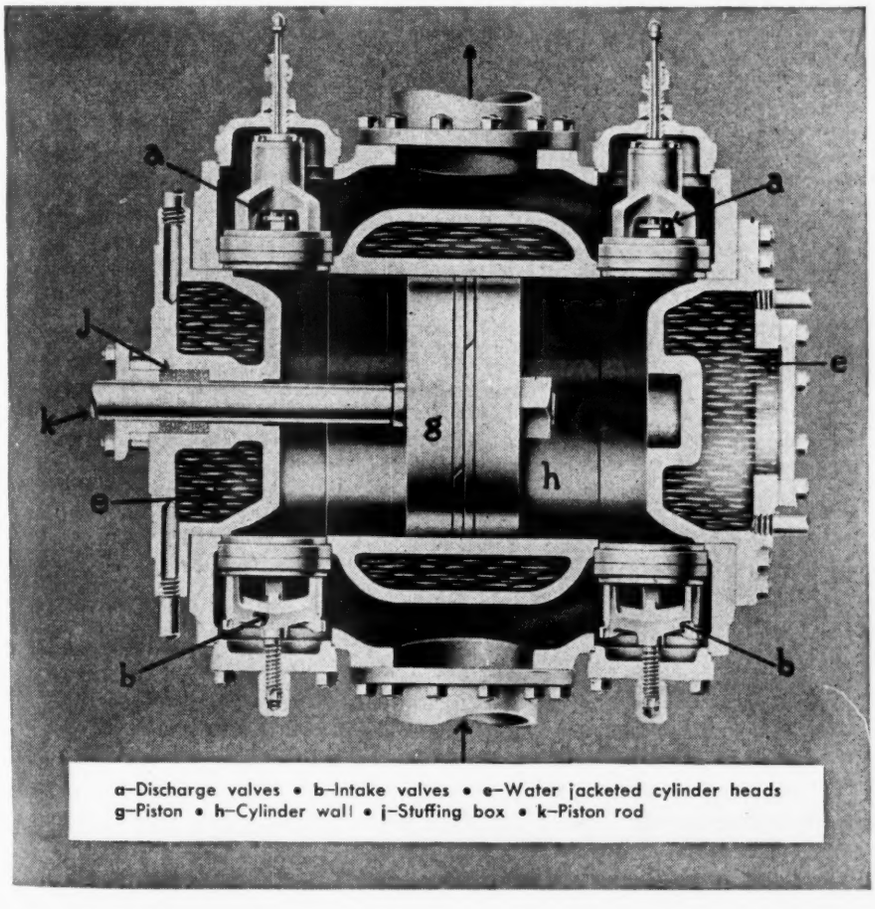
Case No. 2:

"A utility plant* in Springfield, Mo., uses compressed air from a single stage belt-driven air compressor in connection with overhauling jobs of the boilers in their plant. They are all of the water tube type and are overhauled at regular intervals. During these overhauls they need a constant supply of air. The unloading valve of this compressor would gum up to the extent that they would have to clean it about every other day when using a competitor's oil. I sent them a drum of Cities Service North Star Oil No. 5 about a year ago, and checked with their Chief Engineer last month. He tells me they haven't had to clean the unloading valve since putting in the North Star Oil."

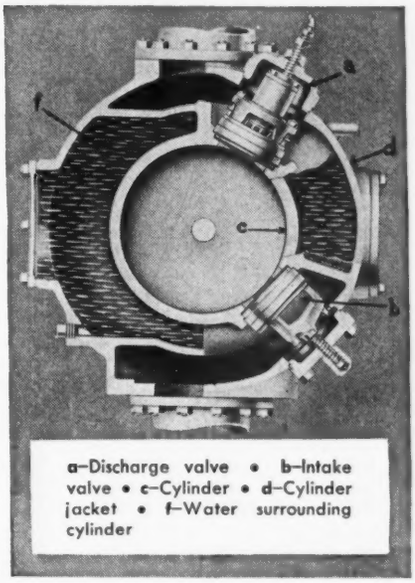
Case No. 3:

"We have lubricated a 1000 cubic foot two-stage air compressor in the Mid-Continent area for over three years. The customer* says that in using Cities Service North Star Oil No. 5 in this compressor he hasn't had any valve breakage and that carbon deposit on valves and seats has been down to practically nothing."

Names on request.



a–Discharge valves • b–Intake valves • e–Water jacketed cylinder heads
g–Piston • h–Cylinder wall • j–Stuffing box • k–Piston rod



a–Discharge valve • b–Intake valve • c–Cylinder • d–Cylinder jacket • f–Water surrounding cylinder

Solving compressor operating problems has been Cities Service's special forte for years. A phone call or card to the Cities Service office nearest you will bring this engineering experience to *your* plant. There is no obligation. For useful information that every air compressor owner and operator should know, write for our free booklet, "Air Compressor Lubrication." Cities Service Oil Co., Sixty Wall Tower, New York 5, N. Y., Room 72.

Free Booklet:

Cities Service means Great Service

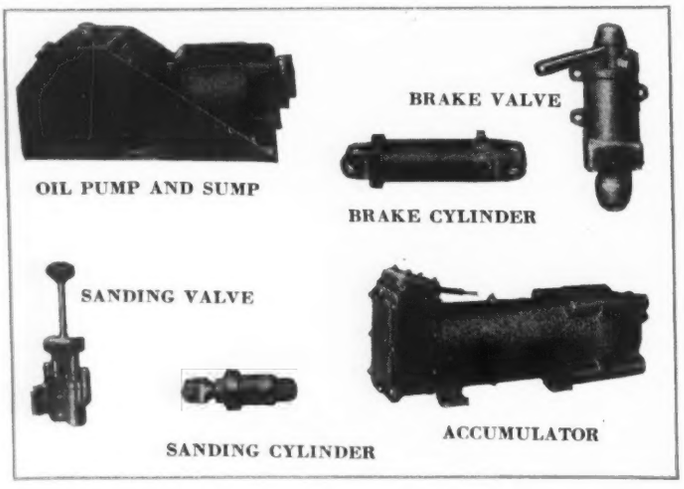
CITIES SERVICE

Cities Service Oil Co.
NEW YORK · CHICAGO

Arkansas Fuel Oil Co.
SHREVEPORT, LA.

WESTINGHOUSE HYDRAULIC BRAKE

for Mine Locomotives



Certainly you can haul a lot heavier loads, at higher speeds, with your modern locomotives . . . but when you do, you've got some brand new braking problems to contend with. It takes a lot more power to stop a trip going 15 miles an hour than one traveling 12. On grades, the heavier loads produce Goliath forces that must be controlled.

There's a modern David to lick this Goliath, in Westinghouse Hydraulic Braking Systems. Parts are small and compact, fit into the unused crooks and crannies of your locomotives. Movement of the brake handle produces corresponding braking pressures, to slow or stop. Speed and accuracy of spotting is greatly increased, excessive maintenance caused by motor bucking is eliminated, operator fatigue is lessened, and safety is better served.

Bulletin S. P. 9092 will give you details.

WESTINGHOUSE AIR BRAKE COMPANY

INDUSTRIAL DIVISION WILMERDING, PA.

beds of coal totaling 100,000,000 tons, 65 percent of which is coking coal. Recovery should average from 70 to 80 percent. Cokes from the upper and lower beds qualify as metallurgical grade, coking more strongly than the Sunnyside bed. Coke from the middle bed is slightly inferior to Sunnyside coke. Thickness in minable areas is as follows: upper bed, 3 ft. 9 in. to 5 ft. 3 in.; middle bed, 1 ft. 10 in. to 10 ft. 3 in.; lower bed, 6 ft. 4 in. to 14 ft. 10 in. Drilling will continue and there will be later reports.

•

Preparation Facilities

Lykens Coal Co., New Boston Junction, Pa.—Contract closed with Wilmot Engineering Co. for four 2½-ft.-dia. Wilmot Hydrotators to prepare buck, rice, barley and No. 4 coal; total feed capacity, 60 t.p.h.

Landingville Coal Co., Landingville, Pa.—Contract closed with Wilmot Engineering Co. for one 2½-ft.-dia. Wilmot Hydrotator to prepare Nos. 4 and 5 coal; feed capacity, 15 t.p.h.

Darkwater Coal Co., Darkwater, Pa.—Contract closed with Wilmot Engineering Co. for one 2½-ft.-dia. Wilmot Hydrotator to prepare rice coal; feed capacity, 15 t.p.h.

Locust Valley Coal Co., Mahanoy City, Pa.—Contract closed with Wilmot Engineering Co. for two 3½-ft.-dia. Wilmot Hydrotators to prepare barley and No. 4 coal, total feed capacity, 45 t.p.h.; and one 12-ft.-dia. Wilmot Hydrotator to prepare No. 5 coal, feed capacity, 40 t.p.h.

Barnes & Tucker Co., Lancashire No. 15 mine, Bakerton, Pa.—Contract closed with Roberts & Schaefer Co. for complete remodeling of present tipple and cleaning plant; capacity, 400 t.p.h. of run-of-mine coal to be crushed to 3-in.; 185 t.p.h. of 3x⅜-in. to be washed in Hydro-Separators; 215 tons of ⅜x0-in. to be cleaned in Stump Air-Flow coal-cleaning units.

Tucker Coal Co., Cedar City, Utah—Contract closed with Roberts & Schaefer Co. for unit Hydrotator complete with screens, tanks, refuse disposal, etc.; capacity, 20 t.p.h. to clean 1¼x0-in.

Sparta Coal Co., Colterville, Ill.—Contract closed with Roberts & Schaefer Co. for unit Hydrotator complete with screens, tanks, refuse disposal, etc.; capacity, 35 t.p.h., to clean ¾x0-in.

Powhatan Mining Co., Powhatan mine, Powhatan Point, Ohio—Contract closed with Roberts & Schaefer Co. for complete coal-preparation plant; capacity, 100 t.p.h.; to clean ¼x0-in. coal in Stump Air-Flow coal-cleaning units.

Darr Smokeless Coal Co., Twin

ONLY

RUBEROID

Insulating Tape has all these 7 Features

1 Double grip . . . both sides adhesive.
2 Great tensile strength . . . tough.
3 Won't tear, ravel or pucker.
4 Resists abrasion.
5 Acid- and alkali-proof.
6 Extra thick . . . one layer insulates.
7 Exceeds A.S.T.M. specifications by 300% in adhesiveness, 26% in tensile strength, 290% in dielectric strength.

RUBEROID

INSULATING TAPE

The RUBEROID Co., Executive Offices, 500 Fifth Avenue, New York 18, N. Y.

A New Locomotive Backed by 25 Years' Experience in the Battery Locomotive field!

GREENSBURG

"RANGER" STORAGE BATTERY

LOCOMOTIVES

All Locomotives CUSTOM-BUILT to your requirements

FEATURES

Oil-tight, leak-proof transmission. Use regular auto oil; change every 6 months.

Strong. Simple. Low maintenance cost.

Extra-long journal springs assure better trackability.

Large motor, to assure more horse power per ton weight of locomotive.

Can be equipped with hydraulic brake.

This locomotive being used for main line haulage at the Blacksmith Coal Company, Novinger, Missouri. This is a 4½ ton locomotive, operating on 30" gauge track. This locomotive built from 3½ to 10 tons — either single or double motor drive — 16" to 56½" track gauge.

MORE HAULING FOR LESS STORAGE BATTERY CAPACITY

THE GREENSBURG MACHINE CO.

Makers of Custom-Built Storage Battery Locomotives

101 STANTON ST., GREENSBURG, PA.

PROMET
THE Engineered BRONZE

A SPECIAL FORMULA FOR EACH APPLICATION makes for their LONGER LIFE

AXLE BEARINGS
JOURNAL LINERS
BUSHINGS and
WEARING PARTS

For
GENERAL ELECTRIC • GOODMAN
WESTINGHOUSE • SULLIVAN
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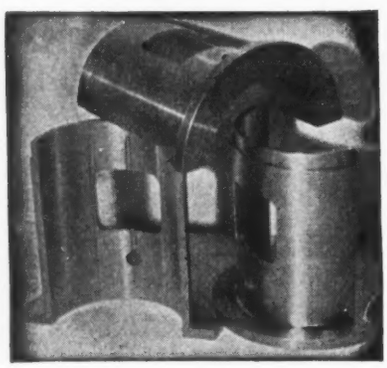
EQUIPMENT



PROMET CASTINGS

Any size, shape or section, up to 3,000 lbs. Pattern making, designing, machining.

★

PROMET BAR STOCK

Round, hexagon, square. Rough cast, semi-finished. Cored stock all sizes (by ⅛" steps) from ½" minimum core to 12" O.D. and 12" lengths. 6 grades of hardness.

★

PROMET MINE SPECIAL BABBITT

Lead base, all virgin metals, perfectly alloyed. Fine, velvety grain. Entire bearing surface wears uniformly, without pitting. Unaffected by moisture. Simply heat to 900°-950° and pour.

Can be repeatedly remelted and reworked. Repouring only refines it. No appreciable shrinkage, hence better contact with supporting shell, a more solid, rigid bearing. Supplied in 10 lb. pigs.

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THE AMERICAN CRUCIBLE PRODUCTS CO.
1307 Oberlin Ave., Lorain, Ohio, U. S. A.

Prompt deliveries can usually be made from stocks maintained at

BECKLEY, W. VA., The Universal Supply Co., 1207 S. Kanawha St. . Phone 3642
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BIRMINGHAM 1, ALA., O. B. Lindstrom Equipment Co. . . . . Box 103
DENVER, COLO., Urquhart Service, 16th St. at Blake . . . Phone Main 0331
MT. LEBANON, PA., J. E. Nieser, 720 Roselawn Ave. . . . . Phone LE-9876
WHEELING, W. VA., Pollish & Company, 110-111 Fidelity Building . Phone 1795
WILLIAMSON, W. VA., Williamson Supply Co. . . . . Phone 1200

Branch, W. Va.—Contract closed with Kanawha Mfg. Co. for Kanawha-Belknap calcium-chloride washer to prepare 50 t.p.h. of 3x1¼-in. stove coal; includes raw-coal conveyor feeding washer and chutes to handle refuse and clean coal leaving washer.

Lake Superior Coal Co., Mine No. 4, Superior, W. Va.—Contract closed with Kanawha Mfg. Co. for rock-disposal system consisting of manually operated gates in weigh basket for by-passing coal to tipple and rock to new inclined belt conveyor delivering to storage bin for truck disposal; system also designed for loading run-of-mine in case of tipple shut-down.

Grapevine Coal Co., Madisonville, Ky.—Contract closed with Jeffrey Mfg. Co. for unit washer; 65-t.p.h. raw-coal feed, 3x0-in.

Pardee & Curtin Lumber Co., Bergoo, W. Va.—Contract closed with Jeffrey Mfg. Co. for tipple; 25-t.p.h. raw-coal feed, 1¼x¾-in.

Mary W. Sickler Estate, Plymouth, Pa.—Contract closed with Deister Concentrator Co. for two SuperDuty Diagonal-Deck coal-washing tables and one Concenco revolving feed distributor.

Mine Fatality Rate Lowered in February

Accidents at coal mines in the United States caused the deaths of 66 bituminous miners and 11 anthracite miners in February, 1947, according to reports furnished the U. S. Bureau of Mines by state mine inspectors.

For the two industries combined, in producing 54,882,000 tons, the preliminary February, 1947, fatality rate was 1.40 per million tons, considerably less than that of 1.76 for January, 1947, but higher than that of 1.35 for February, 1946, later revised to 1.52.

With a production of 50,640,000 net tons, the preliminary bituminous fatality rate was 1.30 per million tons, a fraction lower than the revised rate of 1.31 for January but slightly higher than the revised rate of 1.25 for February, 1946.

The preliminary anthracite rate for February, 1947, in mining 4,242,000 net tons, was 2.59 per million tons, less than half the January rate of 6.98 and almost half the revised figure of 4.39 for February, 1946.

February, 1947, fatalities, by causes and states, and comparable rates for the first two months of 1947 and 1946, were as follows:

U. S. COAL-MINE FATALITIES IN FEBRUARY 1947, BY CAUSES AND STATES

State	Underground: Falls of roof	Falls of face	Haulage	Gas or dust explosions	Other causes	Total underground	Shaft	Opencut	Surface	Grand total
Alabama	2	2	1	..	..	5	..	..	..	5
Colorado	1	..	..	..	..	1	..	..	..	1
Illinois	..	..	2	..	..	2	..	..	1	3
Indiana	2	..	..	..	..	2	..	..	..	2
Iowa	..	..	..	..	..	..	1	..	..	1
Kentucky	7	..	..	..	..	7	..	..	1	8
Ohio	1	..	3	..	..	4	..	1	..	5
Penna. Bituminous	3	..	4	..	..	7	..	..	1	8
Tennessee	1	..	1	..	..	2	..	..	..	2
Virginia	1	..	..	..	..	1	..	..	..	1
West Virginia	16	2	7	1	1	27	..	..	2	29
Wyoming	..	1	..	..	..	1	..	..	..	1
Total Bituminous	34	5	18	1	1	59	1	1	5	66
Penna. Anthracite	5	2	2	..	..	9	..	1	1	11
Grand Total	39	7	20	1	1	68	1	2	6	77

DEATHS AND FATALITY RATES AT U. S. COAL MINES, BY CAUSES OF ACCIDENTS* JANUARY-FEBRUARY, 1947 AND 1946

Cause	Bituminous: Number Killed		Bituminous: Killed per Million Tons		Anthracite: Number Killed		Anthracite: Killed per Million Tons		Total: Number Killed		Total: Killed per Million Tons	
	1947	1946	1947	1946	1947	1946	1947	1946	1947	1946	1947	1946
Underground:												
Falls of roof and face...	82	84	0.749	0.801	20	23	2.129	2.354	102	107	0.858	0.933
Haulage	36	31	.329	.295	3	7	.319	.716	39	38	.328	.331
Gas or dust explosions:												
Local	3	..	.027	....	..	..	....	....	3	..	.025	....
Major	..	15	....	.143	15	..	1.597	....	15	15	.126	.131
Explosives	3	1	.027	.010	3	1	.319	.103	6	2	.051	.017
Electricity	..	3	....	.028	..	1	....	.103	..	4	....	.035
Machinery	5	3	.046	.028	..	..	....	....	5	3	.042	.026
Shaft	1	1	.009	.010	..	..	....	....	1	1	.008	.009
Miscellaneous	1	8	.009	.076	1	4	.106	.409	2	12	.017	.105
Total underground	131	146	1.196	1.391	42	36	4.470	3.685	173	182	1.455	1.587
Stripping or opencut	2	4	.018	.038	3	2	.319	.205	5	6	.042	.052
Surface	10	10	.092	.096	2	4	.213	.409	12	14	.101	.122
Grand Total	143	160	1.306	1.525	47	42	5.002	4.299	190	202	1.598	1.761

*All figures are subject to revision.

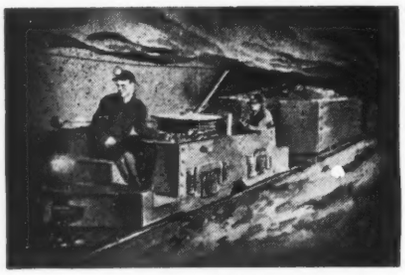
New... *Ful-Vue Acetate Goggles*

...for Lightweight, Good Looking Protection!

Sturdiness and smartness see "eye-to-eye" in these new spectacle goggles by AO. They provide assured protection with better feel, fit and comfort. You will appreciate the comfort of the strong but lightweight new keyhole bridge, face-formed for wearing ease . . . the nose pads which evenly distribute goggle weight. Ful-Vue advantages include lenses that conform to and cover eye orbit for maximum vision and safety . . . high set end pieces that take hinges and temples out of line of sight. Available in 5 bridge sizes, with clear lenses for machine, hand tool and laboratory work — or with Calobar lenses to combat glare, heat, ultra-violet and infra-red hazards. Your nearest MSA Representative can supply you.

American Optical COMPANY

Safety Division — SOUTHBRIDGE, MASSACHUSETTS. BRANCHES IN PRINCIPAL CITIES



Equipment News

More Detailed Information and Descriptive Literature Normally Are Available on Request Directly to the Manufacturer

Anti-Corrosive Process

"Zincilate," an anti-corrosive process that is said to afford 20-year protection to ferrous metals against all common corrosive forces, has been announced by Industrial Metals Protectives, Inc., Dayton, Ohio. "Zincilate" is reported to be unaffected after 1,000-hours exposure in standard salt-fog corrosion equipment, as approved by the American Society for Testing Materials. It is a "one-coat" protective coating and is said to possess remarkable abrasion resistance. Even when sizable areas are destroyed by unusual scraping or wear, lasting protection is assured through cathodic sacrifice of the film.

•

Rubber-Tired Dozer

A high-speed rubber-tired Model C Tournadozer, latest addition to the LeTourneau line of rubber-tired earthmoving equipment, powered by a 160-hp. diesel engine, has been announced by R. G. LeTourneau, Inc., Peoria, Ill. It has four forward speeds ranging up to 12 m.p.h., and the same four speeds are available in reverse.

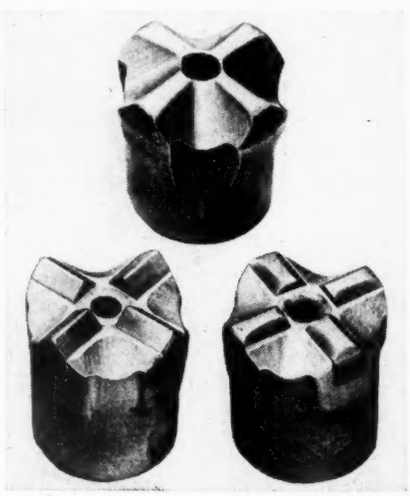
Mounted on four 14x32 taper-bead tires, the Tournadozer is said to be designed so that as power requirements increase because of digging or push loading, greater weight is put on the tires, giving them more ground-gripping traction and flotation. Operation at low air pressures minimizes equipment maintenance, increases operator comfort and reduces tire expense. The high-speed Tournadozer is said to be at its greatest advantage on work requiring much backing and maneuvering and ability to operate over paved areas without damage further broadens job mobility and usefulness.

Over-all specifications of the C Tournadozer are: wheelbase, 5 ft. 11⅝ in.; length, 15 ft. 2 in.; height, 7 ft. 11 in.; width of blade, 11 ft. 3 in.; height of bowl, 44 in.; height blade can be raised above ground, 44 in.; distance blade can be lowered, unlimited; shipping weight, approximately 14½ tons.

•

Rock Bits

A development in rock-drilling bits which, according to all tests so far, promises new high-speed drilling and longer bit service, has been announced by Carboloy Co., Inc., Detroit. Developed cooperatively with Ingersoll-Rand Co., the new equipment consists of permanently mounted ultra-hard Carboloy-cemented-carbide inserts in four-point Jackbits. To go along with this, Ingersoll-Rand has developed a new, special, harder and longer wearing alloy-steel drill rod with a special high-toughness stud connector to mount the bits on the drill rod. The new Carboloy-set



40-Ton Truck on Performance Tests

Believed to be the largest truck ever built, this 40-ton-capacity unit, weighing 80 tons, recently completed in the experimental department of the Euclid Road Machinery Co., is shown being loaded by a 6½-cu.yd. shovel at the Mississippi mine of the M. A. Hanna Co., on the Mesabi Iron Range, where its performance is being tested and observed by Euclid engineers. The truck, which is still in the experimental classification, is powered by a 12-cylinder, 550-hp. supercharged Cummins diesel engine. The Goodyear Hard Rock lug tires sizes are: 18.00-24 on the front and 16.00-32 for the eight others on the two drive axles, each of which is 5½ ft. in diameter.

A close-up picture of your maintenance costs will reveal that the extra service you get from J&L Precisionbilt Preformed Wire Rope saves you money. This extra service is built into all J&L ropes. It will pay you to specify them for all your equipment.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

GILMORE WIRE ROPE DIVISION

PITTSBURGH 30, PENNSYLVANIA

J&L *Precisionbilt* PERMASET PRE-FORMED WIRE ROPE

Investigate

this MODERN Core-Drilling Machine

It's Engineered to Meet Your Most Severe Demands

Sprague & Henwood Core Drilling Machines are modern in every respect . . . Can EASILY perform the work expected of them! That's because they are built to meet the demand of present day core drilling work! The machines are high speed, exceptionally sturdy, constructed to withstand rugged service. Available with two distinct types of feeds. "Screwfeed" and "Hydraulic," according to the type of swivel head selected. Have many exclusive features. Write today for full details.

Bortz **DIAMOND BITS** are also manufactured by Sprague & Henwood. Full details sent upon request.

SPRAGUE & HENWOOD, INC.

Dept. K **SCRANTON, PA., U. S. A.**

G.M.C.

STATIONARY MOTOR RESISTANCE

. . . built of helical coils of alloy resistance-wire, supported by an external frame for complete protection. Coils are alloy wire (contains no nickel) highly resistant to mine water or mill fumes. Vibration or sudden temperature changes will not affect coils. Units can be stacked and bolted together.

Write for catalog, shows all G.M.C. Mine Equipment.

GUYAN Machinery Co.
LOGAN, W. V.

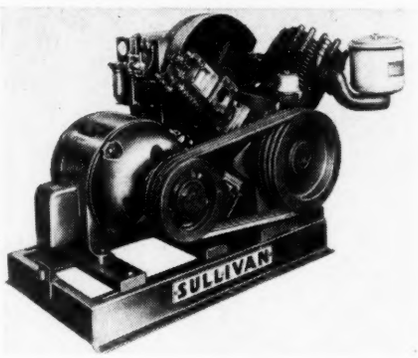
Jackbits are completely interchangeable with the new line of standard-steel stud-type Ingersoll-Rand 4-point Jackbits and may be used with drifters or stopers as well as jack hammers.

In general, the company says, the new bits will produce between 50 and 200 times (depending on type of formation being drilled) the depth of hole obtainable with steel bits without reconditioning. Tests in drilling of Indiana limestone showed an almost indefinite life for the new bits.

•

Compressors

A complete new line of two-stage, air-cooled stationary air compressors has been announced by the Sullivan Division, Joy Mfg. Co., Pittsburgh 22. The new Unitair compressors are available in nine sizes with power requirements ranging from 15 to 100 hp. and piston displacements from 81 to 590 c.f.m. at 100-lb. discharge pressure per square inch, based on 60-cycle motors speeds.



Because of their compact construction and smooth, vibration-free operation, Unitairs require but a small foundation, according to the manufacturer, and the costs of installing water-piping and of supplying water for cooling are eliminated as all Unitairs are completely air-cooled. The three standard electric drives include built-in motor, direct-connected motor and V-belt drive. Unitairs may also be equipped for use with gasoline or diesel engines.

•

Underground Tractor

The Baker Industrial Truck division, Baker-Raulang Co., Cleveland, Ohio, has developed a new permissible mine tractor of improved design

here's the

31

thirty-one lb. drill

with **BIG Drill** *performance*

Gardner-Denver S33 Sinker

Light enough for use in robbing pillars — yet so fast and powerful that it establishes new performance records! No wonder the Gardner-Denver S33 Sinking Drill — weighing only 31 pounds — is getting so much praise from users and operators alike! For here at last is a lightweight drill with *big* drill advantages — a drill with the stamina and quality to stand up in tough service. Look over these features — then you'll know why the S33 is the champion in its weight class:

- ✳ *Reversible pawls and conical pawl springs — pawl plungers are not necessary.*
- ✳ *Generously proportioned piston hammer with larger striking area.*
- ✳ *Extremely short valve stroke that helps reduce wear to absolute minimum.*
- ✳ *Simple valve design admits air directly from throttle valve to the rear of hammer—no tortuous passages.*
- ✳ *Drop forged chuck end—dependable steel puller.*

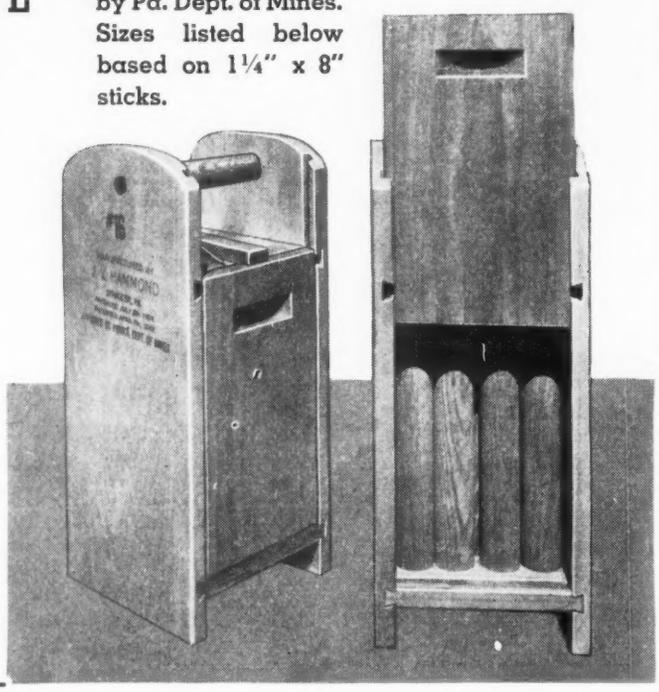
For complete information, write Gardner-Denver Company, Quincy, Ill.

GARDNER-DENVER

SINCE 1859

SAFETY EXPLOSIVE BOXES . . . latest type-all wood

HAMMOND Explosive Boxes are made entirely of wood—have no metal parts. Featured is tongue-grooved and dovetailed construction. Automatic lock uses a rubber band. Approved by Pa. Dept. of Mines.
Sizes listed below based on 1¼" x 8" sticks.



Boxes Made In These Sizes:
No. 9 Powder Box, 9 stick size...$1.35
No. 12 Powder Box, 16 stick size..$1.85
No. 16 Powder Box, 16 stick size..$1.60
No. 20 Powder Box, 20 stick size..$2.10
No. 36 Powder Box, 36 stick size..$3.60
No. 50 Powder Box, 50 stick size..$4.40
No. 72 Powder Box, 72 stick size..$5.20
No. 6 Detonator Box, 2½x3x6 inside $1.20
No. 8 Detonator Box, 2x2½x8 inside $1.20
Special Sizes Made to Order
Patented July 8, 1924.
Patented Apr. 7, 1942

J. V. HAMMOND CO. SPANGLER, PA.

COAL COMES OUT FASTER

"FEMCO" trolleyphones make possible instant voice contact with haulage or gathering locomotives anywhere in the mine . . . eliminates delay, helps move coal faster and permits efficient distribution of empty cars. One operator reported savings of $40 to $50 a day with this system! Write for complete information today!

WHEN CARS AND LOCOMOTIVES ARE DISPATCHED WITH TROLLEYPHONE

FEMCO

FARMERS ENGINEERING & MFG. CO.
549 BRUSHTON AVE. PITTSBURGH 21, PA.

for haulage of various types of trailers carrying coal, supplies or personnel.

The tractor, which has U.S. Bureau of Mines approval, is designed so that the operator may work from either a seated or reclining position, depending upon the height of the seam in which the unit may be operating, according to the manufacturer.

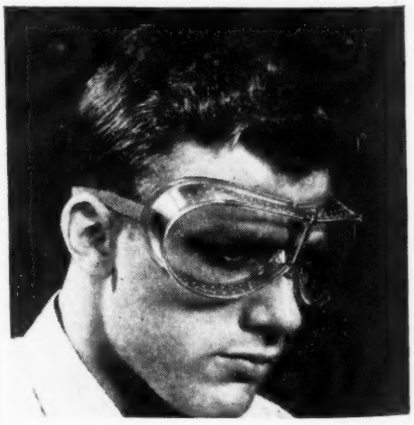
Fire Extinguishers

Two new additions to the General Detroit Corp. and the General Pacific Corp. line of carbon-dioxide fire extinguishers are the 5-lb. and 2½-lb.

sizes, replacing the 4-lb. and 2-lb. CD-Sno Fog carbon-dioxide extinguishers respectively. As there has been no change in price, the new models offer 25 percent increased fire-fighting effectiveness, according to the announcement.

Safety Goggle

A radically new lightweight all-plastic safety goggle with air-conditioned eyecups that reduce possible fogging of lenses has been announced by the American Optical Co., Southbridge, Mass. Through its design and plastic lenses, according to the manu-

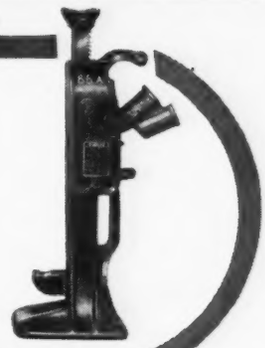


it's SIMPLEX JACKS

through THICK ---------→ or THIN ---------→

FOR THICK SEAMS

The Simplex No. 86A (5-tons), is 20" in height and has a 13" lift. It is the ideal jack for moving and adjusting cutting machines, conveyors and loaders, etc., wherever headroom permits the use of a jack of this size. It is speedy, rugged, and includes such vital safety features as Simplex double lever sockets, extra strong springs and links, short fulcrum centers, etc.



FOR MEDIUM SEAMS

The Simplex No. 85A (5-tons) is 17" in height and has a 10" lift. It provides all the efficiency and safety features of the Simplex No. 86A for locations where more limited height and lift are required. It combines maximum strength, minimum weight, wide concave rack bar toe lifts, large trunnion bearings, strong pawls and reinforced inner-ribbed housings.

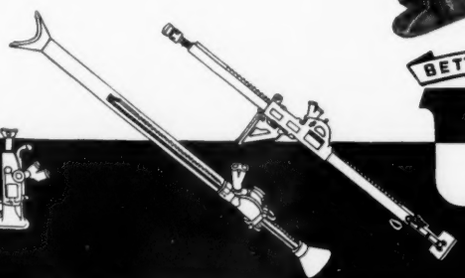
FOR THIN SEAMS

The Simplex No. 84A (5-tons) is 14" in height, has a 7" lift and weighs only 28 lbs. It is designed and constructed for easy handling and use in cramped quarters. This efficiency has been achieved without sacrifice of any of the safety features that have made Simplex Jacks outstandingly popular wherever coal is mined.

Every one of your machines should carry a Simplex Jack of proper size for most efficient operation on the seam being worked. Send for Bulletin—Mines 46.

← **No. 185** (5-tons) Height 17", lift 10". Lifts at right angle to operator on auxiliary shoe.

(10-tons) Height 17", **No. 1017** → lift 9½". For working medium seams. Answers the demand for a light weight, heavy capacity jack for modern heavy mining equipment.

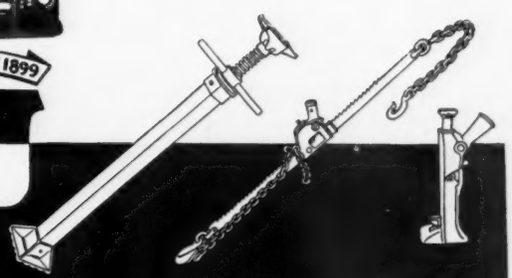


BETTER, SAFER — JACKS SINCE 1899

Simplex

LEVER - SCREW - HYDRAULIC

Jacks



TEMPLETON, KENLY & CO. • 1040 South Central Avenue, CHICAGO 44, ILLINOIS

Lee-Norse GREASING TRUCK

The Modern Mobile Greasing Station

● This modern greasing station on wheels carries Hydraulic oil—Transmission—and Chassis lubricants to the mining machinery at the face. . . . It is fully equipped with air operated grease pump and pressure gun and separate motor driven air compressor. . . . It enables you to apply correct lubricants—easily —quickly—and to keep your mechanical equipment in better shape thus eliminating costly breakdowns and repairs.

We also specialize in complete factory rebuilding and overhauling of Loaders — Cutters — Shuttle Cars and other Mining Machines.

PHONE CHARLEROI 750

Lee-Norse Company
CHARLEROI, PA.

FLEXIPIPE

The improved flexible tubing for mine and tunnel ventilation

This flexible air tubing is ready for immediate, easy installation. On account of its flexibility, it can be put up or taken down in a fractional part of the time required by more rigid means of face ventilation.

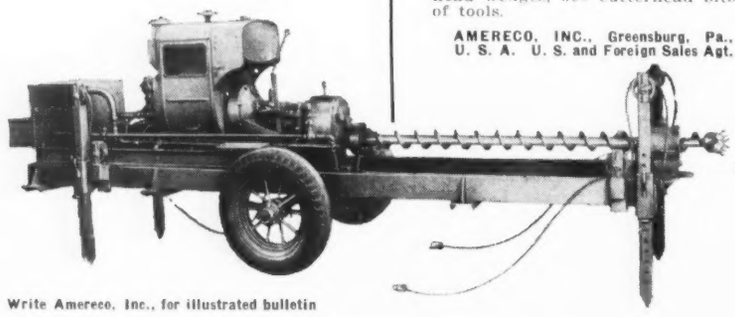
Write for free sample and full information

BEMIS BRO. BAG CO.
412 Poplar Street, St. Louis 2, Mo.

HARDSOCG
HYDRAULIC - HORIZONTAL
D R I L L S

For fast, economical drilling use HARDSOCG Hydraulic Horizontal Drill. Operation is simple, unit is easily moved and all drilling units are equipped with Wisconsin 4-cylinder air-cooled engines, clutch, and 4-speed transmission, secondary reduction unit, 42′ of auger, 5½″ or 6¼″ cutterhead, extra cutterhead wedges, 300 cutterhead bits, and a set of tools.

AMERECO, INC., Greensburg, Pa., U. S. A. U. S. and Foreign Sales Agt.



Write Amereco, Inc., for illustrated bulletin

facturer, the new A-O Panoram goggle protects eyes against particles striking from any direction on jobs such as chipping, grinding, babbitting, riveting, hand-tool and machine operations, rail cutting and spike driving, and provides for exceptionally wide-angle vision.

Perforations at the top and bottom of the eyecups ventilate the goggle and reduce the possibility of fogging. The A-O Panoram goggle has a floating saddle bridge, shaped and positioned to fit against the nose comfortably without pressure. Clear and green lenses are available and the goggle may be worn over most types of prescription glasses. The green lenses are said to reduce excessive glare and absorb ultraviolet radiations.

•

Wetting-Compound

The development of a solidified wetting compound for dust control that proportions, automatically, into the water line itself, has been announced by the Johnson-March Corp., New York. No pumps or motors are required, since the water pressure furnishes the power and does the proportioning. This highly concentrated solidified Compound M cartridge, which is cylindrical in form, 3 in. in diameter by 8 in. long, and weighs approximately 3.6 lb., will reduce the surface tension and make 1,000 gal. of "wet" water, according to the manufacturer. The cartridges are packed 12 to a shipping carton.

The automatic proportioner, which was developed specifically for the application of the solidified Compound M, is a sturdy casting, 4½ in. in diameter and 19 in. high. It is connected directly into the water line and the water pressure itself furnishes the power for both proportioning and spraying. The unit is fully automatic, is designed for over 100 lb. pressure and requires no adjustment or servicing, other than replacing the cartridge as required, it is said.

•

V-Belts

The use of rayon as the reinforcement, or tension member, of all its light-duty and automatic V-belts has been announced by the B. F. Goodrich Co., Akron, Ohio. The new rayon construction, as compared with cotton previously used, gives longer belt life, particularly at elevated temperatures, which are becoming an increasing factor in this field as belt speeds and loads are increased, according to the manufacturer. All the V-belts are made with the company's heat-resistant rubber compounds.

Accelerated laboratory tests indicate that life of light-duty and automotive V-belts has been increased at least 50 percent through the use of rayon cord in tension members, the

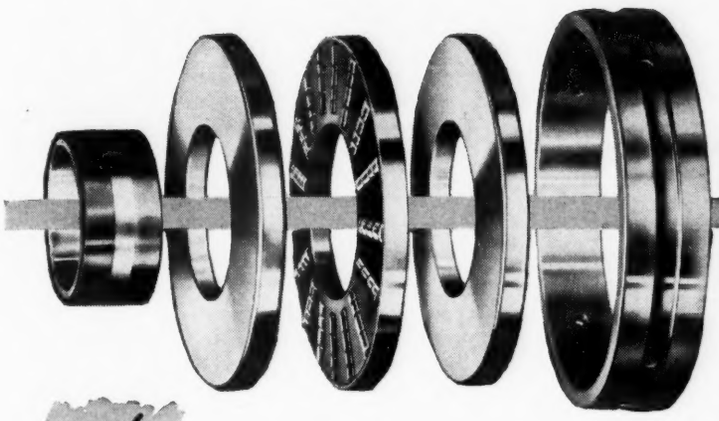
SPLIT YOUR LOAD IN TWO !

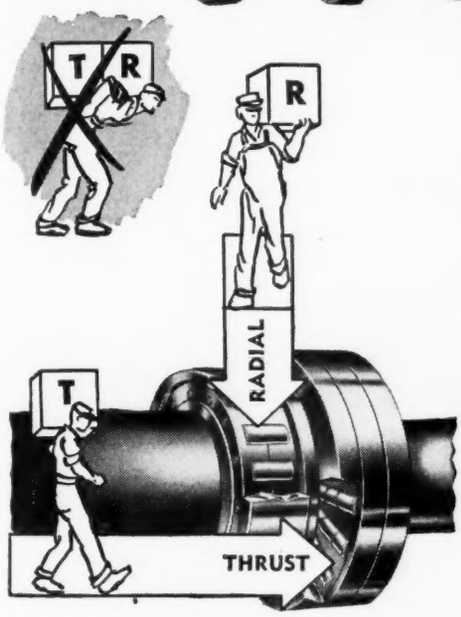
with

ROLLWAY

RIGHT-ANGLE-LOADED

BEARINGS

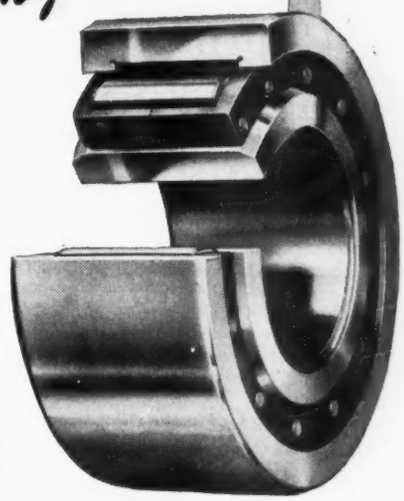




Right-Angle Loading splits compound loads into the two component parts of pure radial and pure thrust... and carries each of these components on separate bearing assemblies. **Simple but scientifically sound.**

1. **Keeps bearings free of complicated stresses**
2. **Gives longer bearing life with higher capacity**
3. **Cuts maintenance cost and lay-up time**

What Right-Angle-Loading Does!



1. Prevents wedging of rollers and pinch-out. Reduces roller end-rub, with its wearing friction. Holds starting and operating torque at a minimum.
2. Since only pure radial or pure thrust loads can be imposed upon any single bearing assembly, unit pressures are reduced substantially.
3. Since all loads are carried at right-angles to the roller surface, compound or oblique loads are avoided and so are the resultants of the oblique loads.
4. Right-angle loading permits greater radial or thrust load-carrying capacity in any given dimension.
5. Right-angle loading assures solid cylindrical rollers of greater roller mass and uniform roller cross-section . . . greater resistance to shock loads and vibration . . longer life expectancy under continuous heavy-duty service.

Free Service!

Select the RIGHT bearings for YOUR particular needs . . .

Rollway engineers will gladly make necessary calculations, drawings and supply other required information for a complete understanding of your bearing problem. No charge.

ROLLWAY BEARINGS

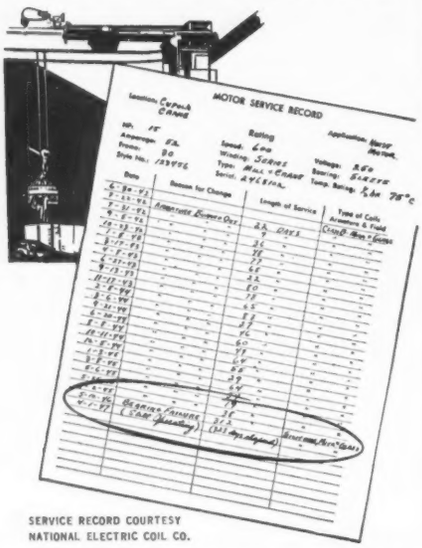
ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Cleveland • Detroit • Chicago • Minneapolis • Houston • Los Angeles

Silicone News

DC SILICONES

DC Silicone Insulation CUTS MOTOR FAILURE 90%!



SERVICE RECORD COURTESY NATIONAL ELECTRIC COIL CO.

A cupola crane motor used to unload scrap in a large steel mill was designed for intermittent service. But steel hungry America kept it working full time to meet war and postwar requirements. Insulated with the best Class 'B' materials, this motor failed 22 times in about three years, giving an average service life of only 50 days.

Design limitations made it impossible to install a larger motor. Lost time, costly rewinding, and heavy maintenance expense seemed inescapable—until DC Silicone Insulation was introduced by Dow Corning.

National Electric Coil Co., of Columbus, Ohio, was one of the first to realize the advantages of Silicone-glass-mica insulation. Their engineers redesigned the coils of that motor using Silicone Insulation—DC 996 Varnish with glass and mica.

Then it operated almost continuously for 312 days—six times the average life with Class 'B' insulation—before a bearing failed, causing mechanical failure of the insulation. The motor was again rewound with Silicone Insulation and was still running April 1, 1947—after 323 days!

DC Silicone Insulation will keep hard-working motors running at least 10 times as long as Class 'B' insulation. That's proved by three years of tough tests and field service. DC 996 is further described in leaflet No. H 3-7.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
New York • Chicago • Cleveland • Los Angeles
In Canada: Fiberglas Canada, Ltd., Toronto
In England: Albright and Wilson, Ltd., London

Dow Corning
FIRST IN SILICONES

company says. Permanent stretch of the new belts is much less than the old.

•

Welder

A general-purpose transformer arc welder, designed for use on single-phase power lines of limited capacity, is now available from Westinghouse Electric Corp., Pittsburgh 30, in three output ratings: 130, 160 and 180 amp. The welder is said to come complete with line breaker, power cable with plug and receptacle, insulated electrode holder, electrode lead with holder and adjustment plug, work lead with ground clamp and adjustment plug, electrodes, helmet complete with lens and cover glass, wire brush, and a welding manual.

The three models, WT-13, WT-16 and WT-18, offer 20 steps of foolproof current adjustment between 20 amp. and the rated maximum and provide two striking voltages: 65 volts for small electrodes on the lower half of the range; 50 volts for larger electrodes on the upper half of the range, according to the manufacturer. Deion circuit breakers control the flow of current to the welder and give overload and short-circuit protection and Class B insulation is used throughout, the company says.

•

Work Glove

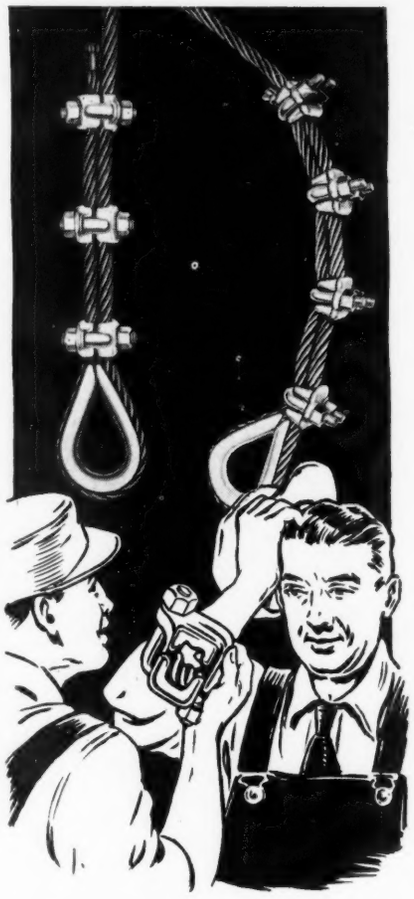
United States Rubber Co., New York, has begun production of a rubber coated canvas work glove that is said to offer better protection to the hands and to have superior wearing qualities. The glove, which is expected to have many industrial uses, is made by dipping the canvas in liquid rubber up to the wrist and then vulcanizing. The result is a tough, waterproof glove that, according to the manufacturer, outlasts many pairs of usual canvas gloves.

•

Electrodes

For rapid and economical welding of mild steel in all positions and with a.c. or either polarity d.c., straight preferred, the new SW-2 electrode, available in four diameters from 3/16-in. to 5/16-in., has been announced by the Westinghouse Electric Corp., Pittsburgh 30.

The SW-2 line is said to provide electrodes in the larger diameters with the desirable characteristics of the Westinghouse SW electrodes. Welds made with SW-2 meet the requirements of AWS-ASTM specifications for classifications E-6012 and E-6013, according to the manufacturer, but have the very desirable characteristics in respect to flat contours, side-wall wash-up, freedom from undercutting and extreme ease of slag removal, provided by the Westinghouse DH electrodes (AWS-ASTM classification E-6020 for flat and horizontal work).



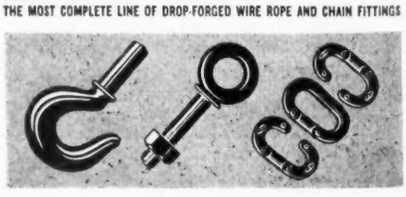
"Get This Straight"

"A bowed rope is a weakened rope, Mac . . . those 'Finger Pinch' U-Bolt Clips crush and bend the rope . . . make the load *uneven* — some strands are overloaded . . . others don't carry their proper load. Results: premature rope failure . . . higher rope costs . . . lessened efficiency. Replace 'em with Laughlin 'Fist-Grip' Clips — they'll make your rope straight like *this* one, because their flat bearing surfaces give uniform pressure over the entire contact area. 'Fist-Grips' are easy to put on, too, Mac . . . even new men like yourself get 'em right the first time because they come in identical halves — you *can't* stagger 'em. Furthermore, three 'Fist-Grips' do the work of four U-Bolts, so you save time. Ask the Supply Room boys for 'Fist-Grips' . . . they prevent many a headache."

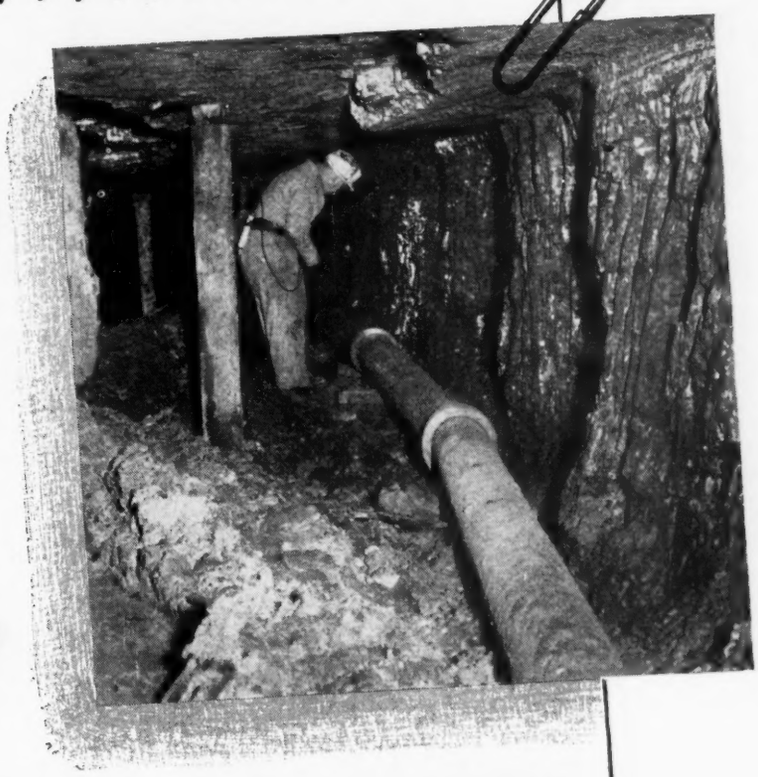
"Fist-Grip" Clips are available at your supply house. Look for the "L" trade-mark. Write for fitting catalog: Dept. 6, The Thomas Laughlin Co., Portland 6, Maine.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS



10 Years Service in 3 Mines



ANOTHER TRANSITE PIPE RECORD in acid mine water service

THE TRANSITE PIPE drainage line pictured above has seen rugged service in 3 mines of the Kelley's Creek Colliery Company. Yet today, *after more than 10 years of exposure to the action of corrosive mine drainage waters,* it is still on the job at the company's Maiden Mine, Maidsville, W. Va.

Such performance is not exceptional for Transite. The high corrosion-resistance of this asbestos-cement pipe has enabled many producers to figure the life of their drainage lines in terms of years—instead of months. Furthermore, this long life may be utilized in different locations as the need arises . . . for Transite can be easily and effectively relocated.

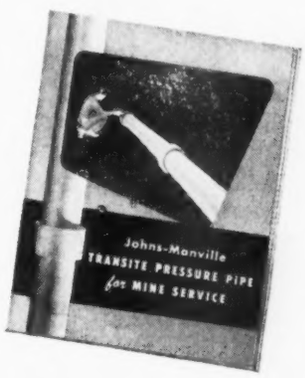
FOR ALL TYPES OF MINE SERVICE

Draining acid mine waters is only one of many ways Transite saves money for coal operators. For water supply lines, Transite offers the advantage of an unusually high carrying capacity—helps assure low pumping costs. For fire prevention ducts . . . for spray and return lines from condenser cooling towers and for many other services where a tough, durable, easily installed pipe is required, Transite provides important economies.

SEND FOR NEW BROCHURE

A new brochure "Transite Pressure Pipe for Mine Service" gives full details about this versatile asbestos-cement pipe . . . tells how Transite can help you eliminate frequent replacements and reduce your pipe line maintenance. Write Johns-Manville, Box 290, New York 16, N. Y. for your free copy of this new brochure.

JOHNS MANVILLE JM PRODUCTS



Johns-Manville TRANSITE MINE SERVICE PIPE

FOR SAFETY'S SAKE...

FOLLOW THE LEADER!

Bituminous Writes More Workmen's Compensation Insurance in the Coal Industry Than Any Other Company.

Bituminous, a pioneer in serving the coal fields, maintains a Safety Engineering program to help save lives, time and money. Safety Engineers reduce the frequency and severity of mining accidents by making sure a mine is safe in every detail. They conduct regular inspections, analyze and correct hazards, and teach workers the importance of safety. The protection and benefits given through this Safety Engineering program to mine owners and operators has enabled Bituminous to lead all other companies in writing Workmen's Compensation Insurance. Bituminous gives SECURITY WITH SERVICE.

ASSETS OVER $17,000,000

BITUMINOUS CASUALTY CORPORATION

ROCK ISLAND ILLINOIS

30 Years of Service to the Industry

Industrial Notes

Jenkins Bros., New York, has elected Alfred J. Yardley president, succeeding his father, Farnham Yardley, who becomes chairman of the board after serving as president for the past 30 years. A great grandson of Nathaniel Jenkins, the founder, Alfred Yardley is the fourth president of Jenkins Bros. in the 83 years of the company's existence. James L. Dunn, vice president in charge of industrial relations, and C. C. Chamberlain, general sales manager, have been elected to the board of directors.

Gardner-Denver Co., Quincy, Ill., has elected Edgar F. Schaefer, formerly executive vice president, president, succeeding H. G. Myers, named chairman of the executive board. Mr. Myers, who takes the post formerly held by the late J. W. Gardner, joined the company in 1927 as chief engineer, becoming executive vice president in 1929 and president in 1935. Mr. Schaefer joined Gardner-Denver in 1919. He was elected vice president in 1926 and executive vice president in 1942.

John A. Roebling's Sons Co., Trenton, N. J., has named J. F. Berger assistant sales manager, Woven Wire Fabrics division. The appointment of Mr. Berger, who has been with the company for 37 years, is coincident with a program of expansion in both

Coal Men Attend Illinois Barbecue

Part of the crowd attending the Mitchell Day barbecue on the farm of A. E. (Red Necktie) Pickard, president, Central Mine Supply Co., at Mt. Vernon, Ill. Despite the cool weather and occasional rain, between two and three hundred guests from more than 35 mines in Illinois and other states were present. The barbecue, the second given by the company for coal men, was this year a stag affair and is expected to be repeated again next year. In addition to all the fixings, the menu included seven whole pigs and three lambs.

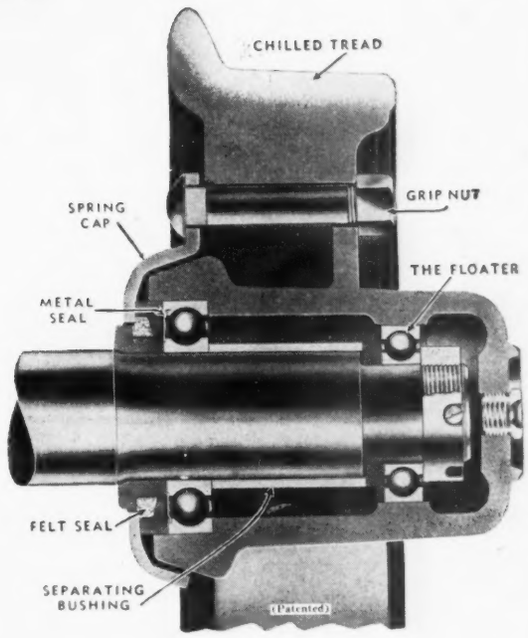
S. D. Means (left), domestic sales manager, O. W. Nelson, vice president and general manager, and P. E. Fulford, export manager, R. G. LeTourneau, Inc., Peoria, Ill., to inspect the 5000th Tournapull, part of a complete new line of electrically-controlled models, as it came off the production line at the Peoria plant.

THIS COMBINATION WILL MAKE YOU MORE MONEY!

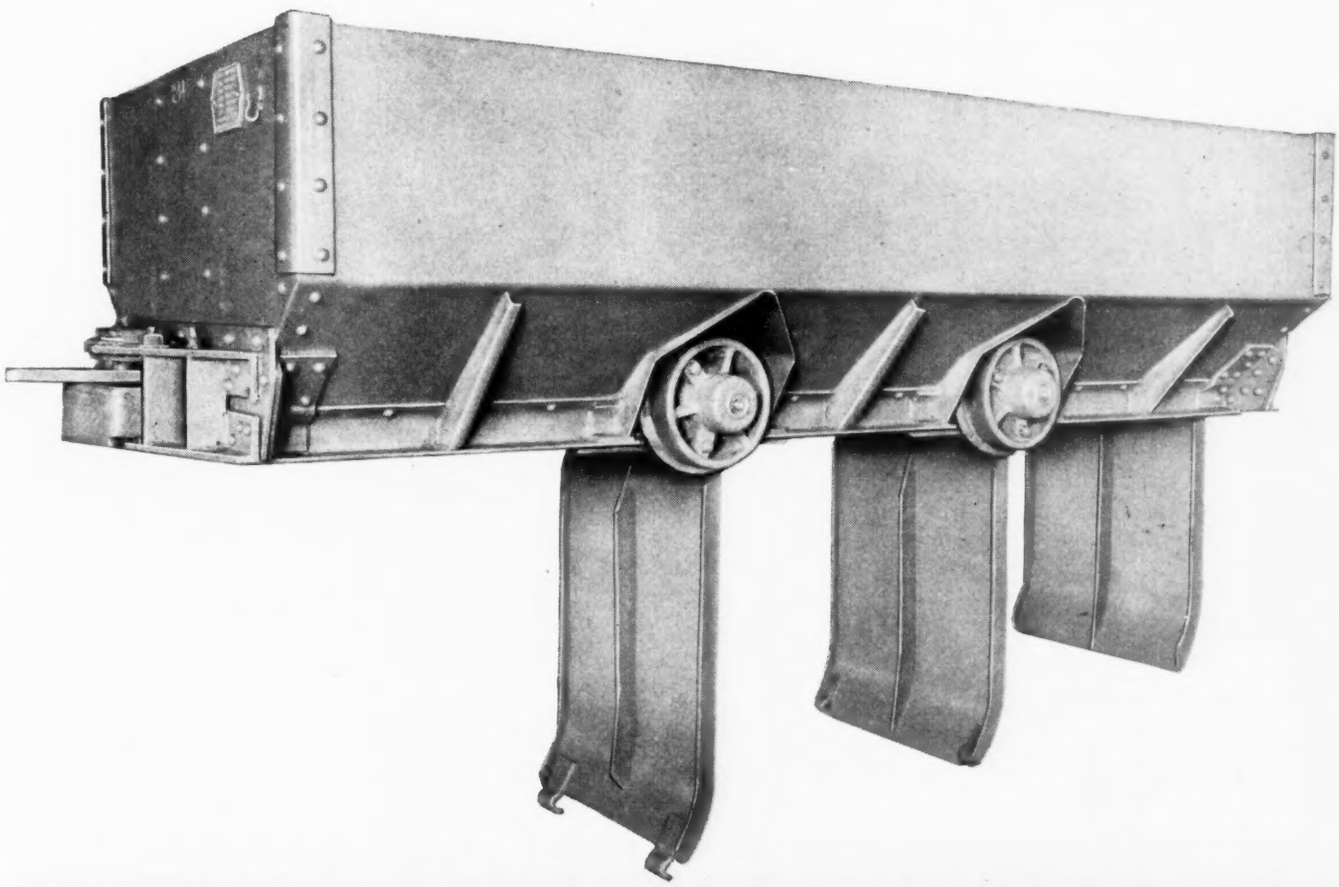
Profits are what you are in business for and we don't expect to sell you S-D cars and wheels if you don't feel that by buying them you will profit greatly. S-D "Automatics" and S-D "Floater" Ball Bearing Wheels is the combination you need.

Any way you look at making more money . . . reducing cost, increasing production, saving time, saving labor, you'll find this combination meeting every requirement for increased profits.

You ought to investigate . . . ask us to show you what others are doing. We've got the dope to prove that our S-D 1-2-3 "Automatic" cars, with our new fool-proof "Jerk-out" unlatching device, and our wonderful wheels can really save you thousands of dollars. You can still lease them at big savings to you if you prefer, and we sure would like to hear from you.



No other wheel can equal, point for point, the advantages of the S-D "Floater" for low cost operation.



Sanford-Day Iron Works, Knoxville 9, Tennessee

The "C·M·I" CONTINUOUS CENTRIFUGAL

Dewaters granular materials such as the finer coal sizes at a lower cost per ton than any other known method or machine.

And, the dewatered product is in such a physical condition that freezing, clogging of spouts, bins and cars is almost prohibited.

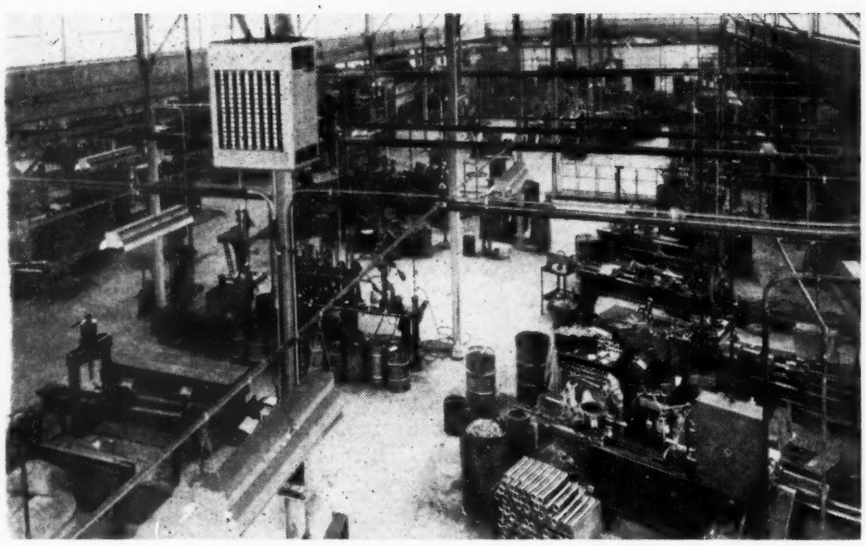
With the liquid being forced through a fine screen by means of the centrifugal forces, the "C-M-I" may be so arranged that considerable amount of the semi-colloidal fines are discharged with the liquid, or arranged so that most of these fines may be recovered.

Our engineering staff will appreciate having the opportunity of going into the details of your drying problems.

Centrifugal and

Mechanical Industries
INC.

3600 South Second Street
St. Louis 18, Mo.



Central Mine Streamlines New Plant

Partial view of the new streamlined plant especially designed for manufacture of the Coalmaster line of drilling tools recently completed by the Central Mine Equipment Co., St. Louis, Mo. The new modern building, which has 42,000 sq. ft. of space on one floor, is said to have been built on a "flow-line" plan, and machinery and equipment are so located as to expedite each step in the manufacturing process, from raw materials to the final product. Added efficiency and elimination of lost time and back-tracking are important features of the new plant, the company says.

machinery and products for the division, which is part of Roebling's $6,000,000 investment in modernization and increased production facilities.

Cummins Engine Co., Inc., Columbus, Ind., has appointed two new regional managers, Walter N. Westland for the Eastern and George W. Stevens for the Mid-Continent regions. Mr. Westland was formerly general sales manager of the Marion Power Shovel Co., and Mr. Stevens was district manager of the National Supply Co., Superior Engine division.

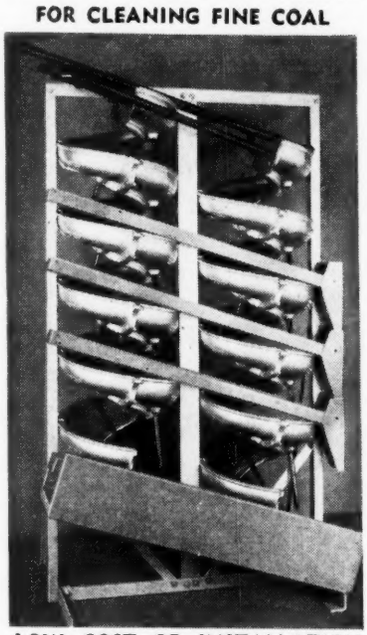
Barber-Greene Co., Aurora, Ill., has appointed State Equipment Co., with headquarters at Harrisburg and a branch at Wilkes-Barre, Pa., as exclusive distributor, representing Barber-Greene Construction and Industrial Division in the following Pennsylvania counties: Union, Montour, Northumberland, Snyder, Juniata, Dauphin, Perry, Cumberland, Lebanon, Franklin, Adams and York.

Viking Machinery Sales Corp., Jackson, Mich., has appointed Henry O. Erb, Terre Haute, Ind., as Midwestern representative. Mr. Erb, a coal-preparation consultant with many years experience in the development and application of coal-washing equipment, expects to also continue his consulting service.

Bemis Bro. Bag Co., St. Louis, has elected A. H. Clarke a vice president, in charge of a newly formed general production department. Mr. Clarke joined Bemis in 1915 and has served the company in many responsible positions since that time, acting as manager of the Bemis cotton mill and bleachery at Indianapolis until his recent promotion.

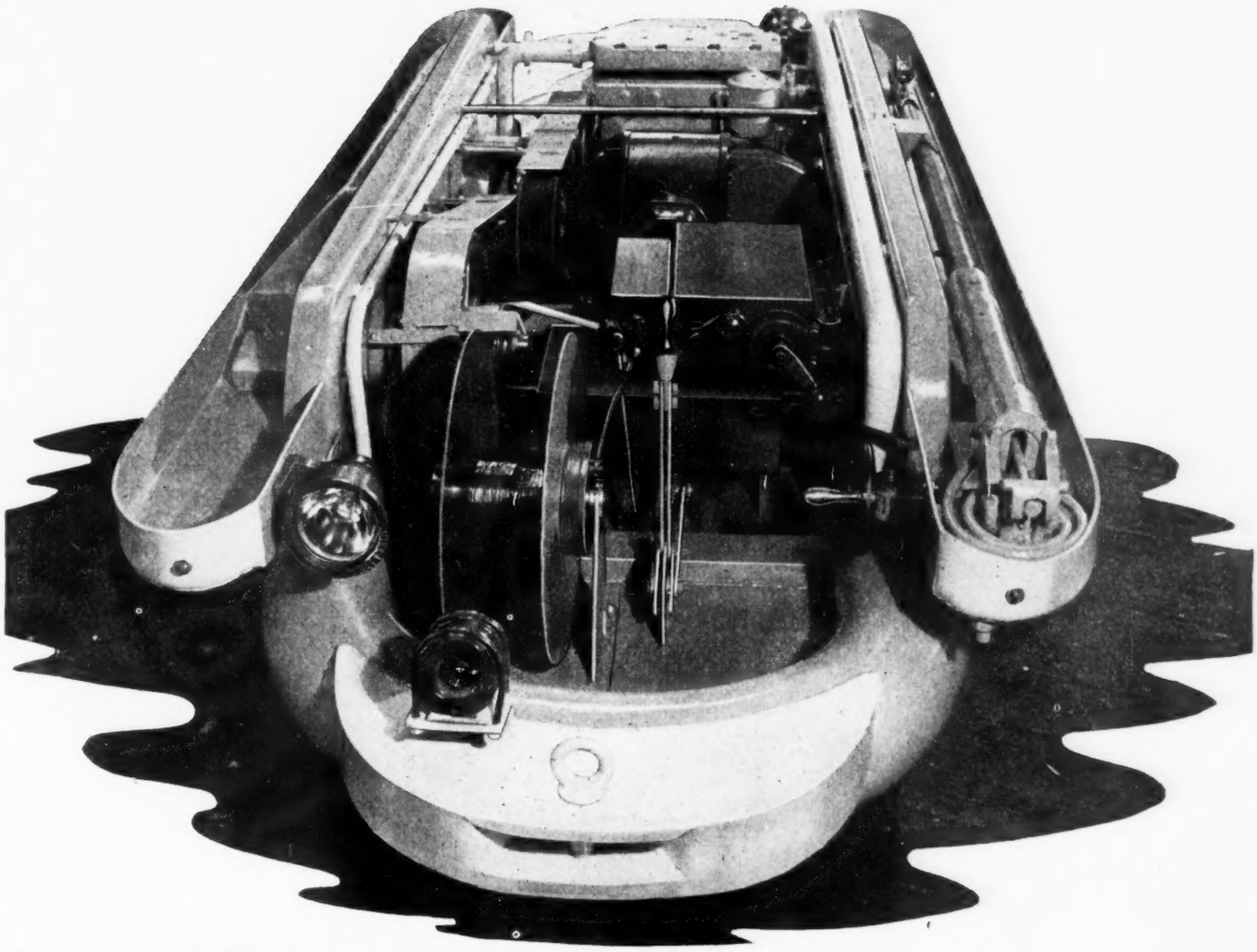
Falk Corp., Milwaukee, has appointed Ken O. Hood Pacific Coast district manager, with offices in Los

HUMPHREYS SPIRAL CONCENTRATOR
FOR CLEANING FINE COAL

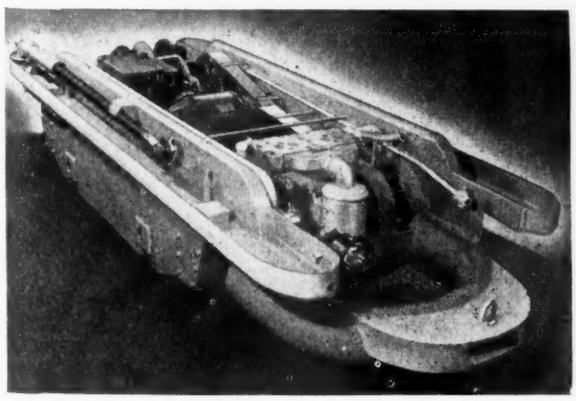


LOW COST OF INSTALLATION
NO MOVING PARTS
LOW OPERATING COST

Engineering Division
The Humphreys Investment Co.
First National Bank Building
DENVER 2, COLORADO



THIS CANTRELL "S-P" DELIVERS "ON THE SPOT" COMPRESSOR SERVICE



Top photo above shows a detail operating end view of the Cantrell Type "S-P" Compressor. A simple shift of lever changes unit from locomotive to compressor service. Opposite end of machine is shown in small photo. Safety top has been removed in both.

Cantrell COMPRESSORS

Yes, we do mean "DELIVERS", because the Cantrell Type "S-P", Self-Propelled Compressor delivers your crew to the spot, produces compressed air where it's needed . . . delivers dependable service and returns . . . all under its own power. That's a mighty important feature for operators who want to keep their heavy locomotives and crews free for other work. And when you consider that this combination two-ton locomotive and compressor takes on jobs like ditch lining, leveling haulways, shifting mine cars, pumps and m'ning machines, hauling repairs, riveting, and blowing substations, you'll see why no modern mine is completely equipped without the Cantrell "S-P" Compressor.

Why not write today for complete information about Cantrell Compressors. Five types of compressor outfits are built to meet every requirement of track or trackless mining or stationary shop use . . . one of them is certain to meet your requirements.

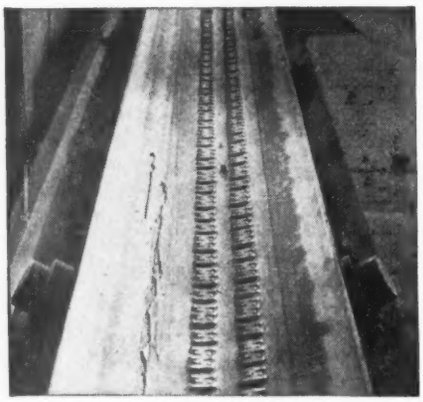
IMPERIAL-CANTRELL MFG. CO., JELLICO, TENNESSEE

CONVEYOR BELTS

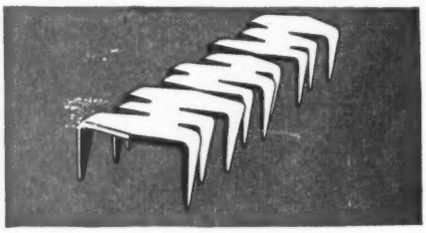
fastened or repaired

ON THE JOB

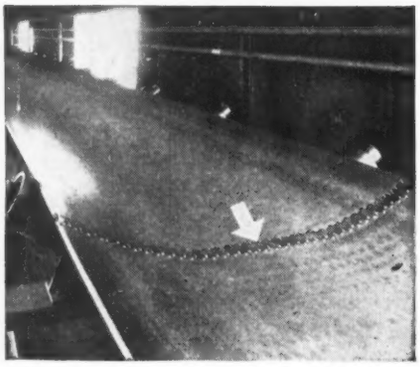
in a few minutes



All you need are hammer, block of wood and . . . .



BRISTOL'S BELT LACING



For rubber or woven conveyor belts up to $\frac{13}{16}$" thick.
Write for Bulletin 736.

THE BRISTOL COMPANY
Mill Supply Division
139 Bristol Road, Waterbury 91, Conn.
DISTRIBUTORS EVERYWHERE

Angeles, to direct Falk sales in California, Washington, Oregon, Nevada, New Mexico, Arizona, Colorado, Utah, and parts of Wyoming. Kenneth W. Morrissey has been named Cincinnati district manager to succeed Mr. Hood.

Titan Metal Mfg. Co., Bellefonte, Pa., has appointed Paul R. Spencer & Co., Denver, Colo., as sales agents for all Titan brass and bronze products in Colorado, Montana, Nebraska, Arizona, New Mexico and West Texas. Forbes Co., Salt Lake City, has ben appointed sales agents for Utah, Idaho, Nevada, Wyoming and South Dakota.

National Malleable & Steel Castings Co., Cleveland, has elected Stowell C. Wasson, manager of its two Chicago works at Cicero and Melrose Park, a director. Mr. Wasson has been associated with the company since 1911 in sales and manufacturing activities.

Mack-International Motor Truck Corp., New York, has named Henry Rowold assistant general sales manager. Mr. Rowold, also a vice president of the company, combines his new duties with those of national accounts manager, a position he has held for some time. John A. Sloan, formerly district manager of the Des Moines, Iowa, direct factory branch, has been appointed to the same capacity at Mack's Chicago branch. A. L. Monck, formerly of Mack's St. Louis branch, has succeeded Mr. Sloan in charge of the company's Des Moines branch.

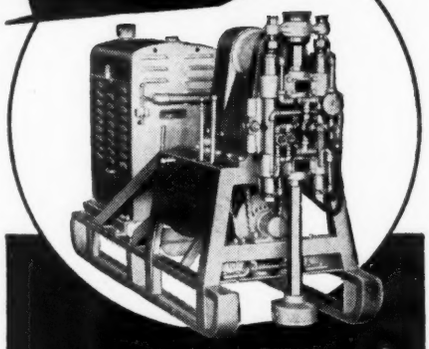
Central Mine Equipment Co., St. Louis, has appointed the Joy Mfg. Co. a distributor of its Coalmaster drilling tools.

Okonite Co., Passaic, N. J., has appointed Edward A. Damrau, formerly in charge of its Pittsburgh, Pa., office, manager of a newly opened branch office at 601 Chamber of Commerce Bldg., Charleston, W. Va. Mr. Damrau will handle all electrical wire and cable sales in West Virginia and adjacent parts of Kentucky and Virginia for both Okonite and its Hazard Insulated Wire Works Division.

John W. Patterson Co., Pittsburgh, has elected James H. Morris president, succeeding John W. Patterson Sr., founder of the company, who died March 8. Mr. Morris was with the company from 1933 until the war and was most recently industrial manager for Allis-Chalmers Mfg. Co. in New York State.

Johns-Manville Corp., New York, has announced the purchase of the factories and other properties of the Goetze Gasket & Packing Co., Inc., New Brunswick, N. J. Goetze gaskets will be produced as formerly at the Goetze plant and sold by Johns-Manville under the Goetze name. It is also expected that an expanded use will be made of Goetze's plant

Diamond Core Drilling
CONTRACTORS



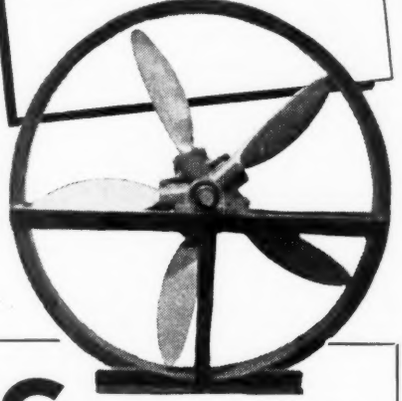
Testing mineral properties with our light gasoline drills. SATISFACTORY COAL CORES GUARANTEED. Ground solidification by our pre-pressure grouting method for shafts. Wet mine areas, horizontal holes for drainage. Electric drills for inside mine drilling.

MOTT CORE DRILLING CO.
HUNTINGTON • WEST VIRGINIA

G.M.C.

Venta-mine FANS

Made in 4 sizes, 36", 48", 60" and 72". All have cast aluminum blades—60" and 72" adjustable pitch. Write for details.



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Logan W. Va.

THE **OHIO**

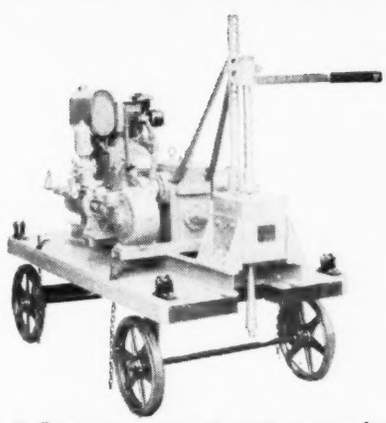
MOTOR CHARTING SERVICE

Our engineering department is capably staffed to make a survey of all motors and generators in your plant and to recommend the proper brushes to be used in each case and compile all technical data into book form for your references. It will be your guide to efficient operation and increased production.

IT'S ABSOLUTELY FREE OF CHARGE!

THE OHIO CARBON COMPANY
12508 BEREA ROAD
CLEVELAND 11, OHIO

CORE DRILLS



- Accurate cores of coal seams by using single or double tube core barrels.
- Ideal for determining overburden before strip mining.
- Diamond—alloy or steel shot bits.
- Light weight — easy to move in rough country.

SEND FOR BULLETINS

ACKER DRILL CO.
SCRANTON 3, PA.

facilities, according to the announcement.

Jessop Steel Co., Washington, Pa., has appointed A. J. Fischer manager of its Carbide and Cast-Alloy division. Mr. Fischer, who has been associated with the carbide industry for the past 12 years, formerly was assistant to the supervisor of carbide production at the Firth-Sterling Steel Co.

Westinghouse Electric Corp., has appointed A. Frye Ayers as central district industrial manager. Mr. Ayers, who has been central district machinery electrification manager since October, 1940, succeeds J. E. Payne, named manager of headquarters industrial sales.

R. G. LeTourneau, Inc., Peoria, Ill., has named Robert C. Lewis installation manager in its domestic sales division. Mr. Lewis comes to LeTourneau after 10 years with the Cincinnati Highway Department and five years with the U. S. Army Engineers. Keith Thompson has joined the installation department as an applications engineer. E. M. Ferguson, most recently LeTourneau western sales manager, has been appointed eastern sales manager, with offices in Washington, D. C., in charge of LeTourneau sales and service in 23 eastern states. C. D. Fey, formerly industrial sales representative for the western United States, has been named to serve LeTourneau in that capacity for the entire country with headquarters at the company's Peoria plant. The company's central sales office has been moved from Peoria, Ill. to Kansas City, Mo.

Rollway Bearing Co., Inc., Syracuse, N. Y. has opened a new sales office at 507 Renshaw Bldg., Pittsburgh, Pa., with John B. Bell, formerly sales representative in the home office, in charge.

Clark Controller Co., Cleveland, Ohio, has appointed Schroeder Bros., 1709 Investment Bldg., Pittsburgh 22, as sales representatives for the bituminous coal industry in Pittsburgh and the Tri-state area.

Jeffrey Mfg. Co., Columbus, Ohio, has announced the retirement of J. W. White, associated with the company in sales work for 38 years and for many years district manager of the Scraton, Pa., office. P. J. Horrigan, with Jeffrey for the past 11 years, has succeeded Mr. White as Scranton manager.

Valley Machine & Electric Shop, Fairmont, W. Va., has been formed by E. D. Fortney and J. G. Vaughan, formerly associated with Eastern Gas & Fuel Associates, Coal Division. The new firm will handle light and heavy machine work, electrical contracting and the sale of new and used machinery and parts.

Electric Products Co., Cleveland,

MANAGEMENT and PRODUCTION men want

FACTS

about equipment they buy

Here are FACTS about

Coffing Hoists

"SAFETY-PULL"
Ratchet Lever Hoists

For all kinds of construction and maintenance work, wherever a lift or pull is needed, there is a "Safety - Pull" to meet your requirements. SAFE, DURABLE, DEPENDABLE. Capacities range from ¾ to 15 tons, yet they weigh only 14 to 150 pounds.

"QUIK-LIFT"
Electric Hoists

For dependable and economical service the "Quik - Lift" incorporates EFFICIENCY with SPEED, POWER and DURABILITY. Just plug it in and speed up production. Capacities from 500 to 4000 pounds with lifting speeds from 4 to 49 feet per minute.

MODEL Y-C
Spur Geared Chain Hoists

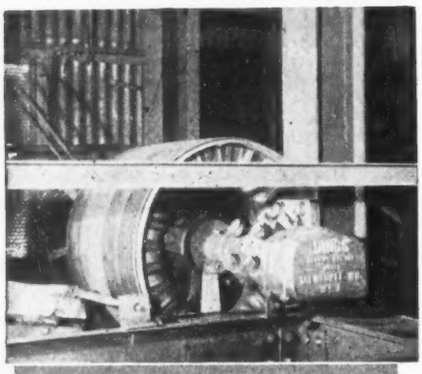
Coffing Spur Geared Chain Hoists embody the planetary gear system with the Weston automatic brake. There are seven capacities ranging from ½ to 5 tons. A sturdy, dependable hoist for heavy work and in the production line.

Contact Your Supplier or Write for BULLETIN GC-100

Coffing Hoist Co.

Danville, Illinois U. S. A.

Protection Against TRAMP IRON for YOU and YOUR CUSTOMERS



with **DINGS** *Magnetic Pulleys*

Protect both your own coal handling equipment and your customer's stokers by installing a powerful Dings Magnetic Pulley to eliminate tramp iron before it can cause expensive damage. Separation is automatic and positive . . . Operating and maintenance cost about a penny a day, depending on pulley size . . . Some operators report "no cost" tramp iron protection because the sale of scrap removed more than pays for depreciation charges and operating expense! Size for size there are no more powerful magnetic pulleys built than Dings. Get full details from Dings today.

NEW! DINGS *Magnetic Drill Extractor*

A powerful Alnico Magnetic Drill Extractor to save redrilling blast holes when drill rod or bits break off in the hole. Dings Extractors lift up to 25 times their own weight ... Easy to use ... Can be carried in a pocket ... Write for data sheet containing complete information.

DINGS MAGNETIC SEPARATOR CO.
506 E. Smith Street, Milwaukee 7, Wisc.

Dings
"HIGH INTENSITY"

Ohio, has appointed Robert H. Ehret assistant sales manager.

Bath Iron Works Corp., Bath, Me., has acquired the Pennsylvania Crusher Co., Philadelphia, and will handle all its production, which has previously been contracted for. G. W. Borton, president, and W. A. Battey, vice president, have at their own request, retired, but will continue as directors. New officers of the firm, which will continue its offices in Philadelphia, are as follows: W. S. Newell, president, J. William Schultze, vice president and treasurer, A. H. Kretschmer, secretary and assistant treasurer, and S. D. Hartshorn, acting general manager.

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Trade Literature

Available Without Charge on Request to the Manufacturer

Tractors — International Harvester Co., 180 North Michigan Ave., Chicago 1. Catalog No. A-103-JJ lists and illustrates International's gasoline and diesel industrial wheel tractors. Applications, matched equipment available and specifications are included, along with sectional views of chassis features.

Earthmover—R. G. LeTourneau, Inc., Peoria, Ill. Booklet No. TP-130 is mainly devoted to captioned action photographs taken on typical Tournapull jobs in the general construction, industrial, railroad, mining, pit and quarry, and export fields, with actual job histories on roadwork, dams, airports, levees, plant-site grading, coal handling, stripping and working gravel pits, and lime reclamation.

Electric Motors — Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio. Bulletin No. C-118 covers "Series C" protected (open-type) induction motors, frame sizes 203 to 326, with horsepower ratings from ½ to 20 hp., 600 to 3,600 r.p.m. Totally inclosed fan-cooled "Series C" motors are described in Bulletin No. C-125, which deals with squirrel-cage frame sizes 224 to 326, for two- and three-phase a.c. circuits. Construction and application details are included in each bulletin.

Pumps—H. K. Porter Co., Inc., Pittsburgh 22. Three individual bulletins describe the Quimby lines of screw pumps, centrifugal sump pumps and the rotary "Streamflow" Rotex pumps. Each bulletin contains detailed engineering, construction, capacity and application information and is profusely illustrated.

Electric Motors—General Electric Co., Schenectady, N. Y. Bulletin describes the construction and applica-

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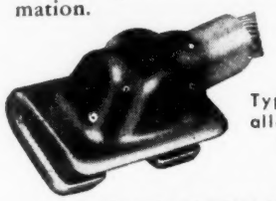
that there are more miles of railroad track beneath Pennsylvania and West Virginia than above ground?

AND DID YOU KNOW . . .

that MESCOWELD Rail Bonds have been used on much of this trackage for over 22 years? Eighteen types meet every requirement. Write or phone for further information.



Type M8-F all-purpose bond

YOU CAN RELY ON **MESCOWELD** RAIL BONDS

Mosebach Electric & Supply Co.
1115 Arlington Avenue Pittsburgh 3, Pa.
HEmlock 8332

PRESSURE CONCRETE
(GUNITE SYSTEM)
by HUDSON RUMSEY CO., INC.

For Repairs & Construction of
- MINE TUNNELS
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- TANKS
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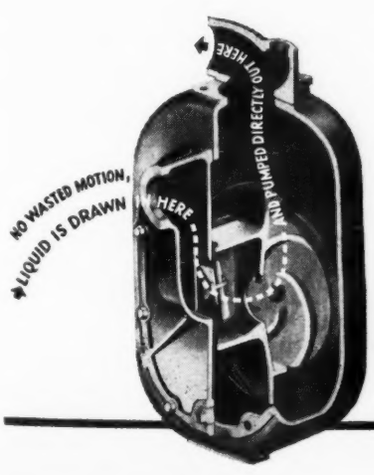
HUDSON RUMSEY CO. INC.
1200 NIAGARA ST. BUFFALO, N. Y.

NEW THRIFT CHAMPION

...THE MARLOW MINE GATHERING PUMP ON TRICYCLE

This efficient self-priming centrifugal is easy to move and position. Hour after hour, without attention, and in out-of-the-way places, it keeps on pumping, even under difficult conditions.

Gritty, corrosive mine waters do not faze the Marlow Mine Gathering Pump. It is specially engineered to help cut mine de-watering costs . . . pumps more water per horsepower than any other gathering pump. Moreover, special metals, specially rugged construction and sound, far advanced design enable a Marlow to stay vigorously at work when others fail. Built to last for years. Made in 2 and 3-inch sizes, 50 to 200 GPM, mounted on sled-type base or rubber tired tricycle (illustrated). Write for Bulletin EM 46.



For strip mines . . . Marlows with the same fully automatic operation; wheel or flat base mounted; gasoline, Diesel or electric. Sizes 1½ to 10-inches, 50 to 4000 GPM. Ask for Bulletin G 46.

MARLOW PUMPS 548 GREENWOOD AVENUE RIDGEWOOD, NEW JERSEY

MANUFACTURERS OF QUALITY PUMPS SINCE 1924

tion of the new Tri-Clad vertical induction motors for pump drives, available in 1 to 500 hp., all speeds and frequencies.

Gears—Pittsburgh Gear & Machine Co., 27th & Smallman Sts., Pittsburgh 22. Price List No. 100 contains renewal-parts prices for "Genuine Pittsburgh Gears" shafts and parts.

Fire Fighting — American-La France-Foamite Corp., Elmira, N. Y. Booklet, "What You Should Know About Modern Fire-Fighting Devices," describes and illustrates the proper use of various fire-fighting devices and shows how small fires may be quickly stopped and prevented from becoming big blazes.

Foundations, Floors—Stonhard Co., 403 North Broad St., Philadelphia 8. Booklet contains useful information on constructing foundations and basements, laying various types of floors, surfacing of exterior and interior wall surfaces, protecting exposed structural members, etc., and points out unusual conditions that must be anticipated.

Chain Belts—Chain Belt Co., 1600 West Bruce St., Milwaukee 4, Wis. Bulletin No. 46-10 on REX steel-fabricated and cast chains illustrates and describes the company's standard chains and includes typical installations, standard attachments and information on REX cast and cut tooth sprockets.

Welding and Flame Cutting—Air Reduction Sales Co., 60 East 42nd St., New York 17. Reprint of several articles appearing in *Coal Age* covers the application of the electric-arc and the oxyacetylene flame in the mining field. Illustrated with nearly 40 photographs, it stresses repair, rebuilding and fabrication of mining equipment.

Foam Suppressor — Dow Corning Corp., Midland, Mich. Bulletin describes DC Antifoam A, a silicone compound recently developed for killing foam in aqueous systems, outlines various methods for using it and methods used in determining its efficiency.

Motor Drives—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Indexed catalog for "pre-engineered" stock Texrope drives designed to simplify drive selection so persons untrained in V-belt engineering can readily specify proper drives is said to represent one of the most outstanding compilations of engineering data ever assembled for the V-belt industry.

Pump—Byron Jackson Co., Box 2017 Terminal Annex, Los Angeles 54, Calif. Bulletin No. 46-6000 covers technical data, applications, cross-section drawings of parts, operation and design features and dimensional sketches of the Hydropress pump, developed for big-pressure, low-volume pumping jobs. Pump sizes covered are 10, 12 and 15 in., with capacities of 20 to 300 g.p.m., and head range 55 to 250 ft. per stage (to pressures of 5000 lb. per square inch).

Welder—Hobart Bros. Co., Troy, Ohio. Bulletin describes the Hobart Weldombile, a complete self-propelled gasoline-engine-driven arc welder that also embodies the multi-range and remote-control features available in other Hobart welders.

Packing—Asbestos Textile & Packing Division, Raybestos-Manhattan, Inc., Manheim, Pa. Condensed catalog covers the most popular styles of mechanical packings in the R/M line and includes a recommendation chart covering practically every type of service.

Pipe—Johns-Manville, 22 East 40th St., New York 16. Brochure TR-51A, "Transite Pressure Pipe for Mine Service," describes the many uses for this asbestos-cement pipe, which is said to feature great resistance to corrosion, light weight that makes it easy to handle and a flexible, quickly assembled Simplex coupling. Installation examples and procedures and dimensional specifications are included.

Roof Maintenance—Stonhard Co., 403 North Broad St., Philadelphia 8. Folder discusses roof maintenance and explains how to stop leaks, renew dried-out roof surfaces, repair flashings and gutters, etc.

Pumps—Worthington Pump & Machinery Corp., Holyoke, Mass. Bulletin outlines the Blue Brute portable self-priming centrifugal pumps available in a complete range of sizes from 1½ to 8 in. Capacity tables and construction details are included.

Drills—Worthington Pump & Machinery Corp., Holyoke, Mass. Bulletin contains descriptions, illustrations, specifications and other details on the Blue Brute UMW-40 wagon drill and WD-40D drifter.

Aftercoolers — Worthington Pump & Machinery Corp., Harrison, N. J. Bulletin No. L-802-B2 describes and illustrates the Worthington Types P and Type W aftercoolers for air and gas. Operation, dimensions and features are outlined.

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Authoritative Valuations, and Reports of Mining Properties Equipment and Operation.
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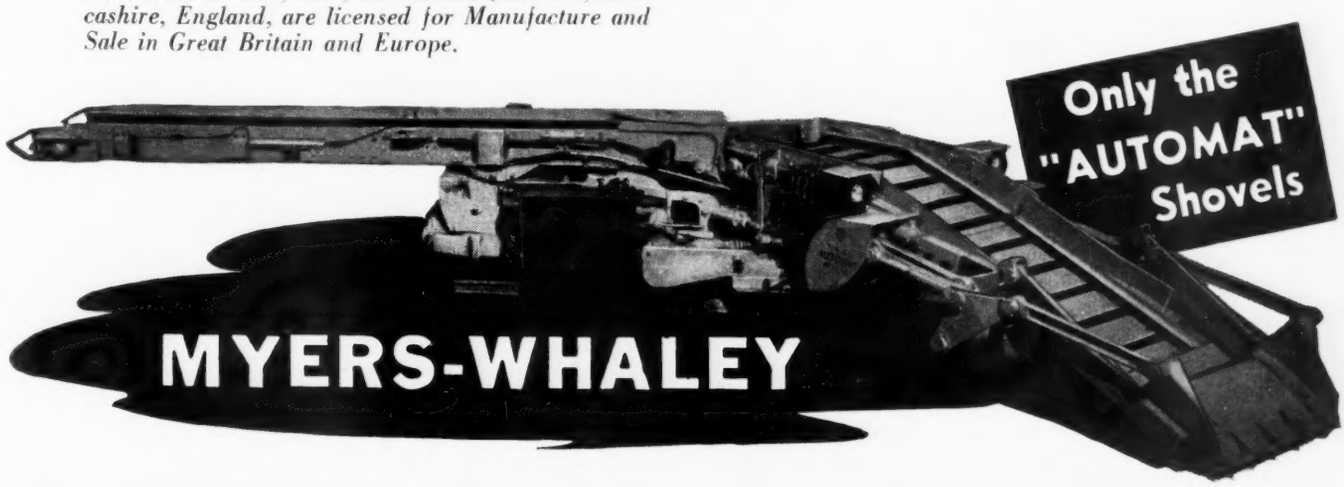
MAXIMUM EFFICIENCY

—Another reason why you need the WHALEY "AUTOMAT"

Wm. Neill & Son, Ltd., St. Helen's Junction, Lancashire, England, are licensed for Manufacture and Sale in Great Britain and Europe.

And when we speak of maximum efficiency, we mean in coal, rock or slate loading. While the Whaley "Automat" is primarily a coal loading machine, it is also a machine of universal application for all underground loading such as brushing of entries in thin seams, cleaning up air course, reopening old workings, making grades. Remember, whether you are loading coal, rock or slate, you get maximum efficiency with the Whaley "Automat" which loads in its stride any lump of coal that will pass through your tipple, or any lump of rock your cars, aerial tram or larries can take. With its rated capacity of 7 tons a minute and an average loading rate of 3 tons, you'll get dependable performance . . . maximum efficiency from the Whaley "Automat"—the only loader with the vertical shovel action loading head. Myers-Whaley Co., Knoxville 6, Tenn.



Mechanical Loaders Exclusively for Over 39 Years

INDUSTRIAL BATTERIES for Sale

HEAVY DUTY USED STORAGE BATTERIES IMMEDIATELY AVAILABLE ON COMPETITIVE BID

Heavy duty batteries are still hard to get on the open market—but now many are available at WAA offices in:

Special Fixed Price Sale

Some unused batteries are also being offered at low fixed prices. To receive listings, write one of the above offices and ask to be placed on the industrial battery mailing list

Most of these special purpose batteries are used. They're in serviceable condition and most are adaptable to a variety of jobs where low-voltage or stand-by power is needed. Made by nationally known firms, they're now being offered to enable you to make complete replacements at surprisingly low cost. Write, wire or phone now—or come in yourself to one of the offices indicated, to make sure you get the batteries you need. Also ask to have your name placed on the used battery mailing list.

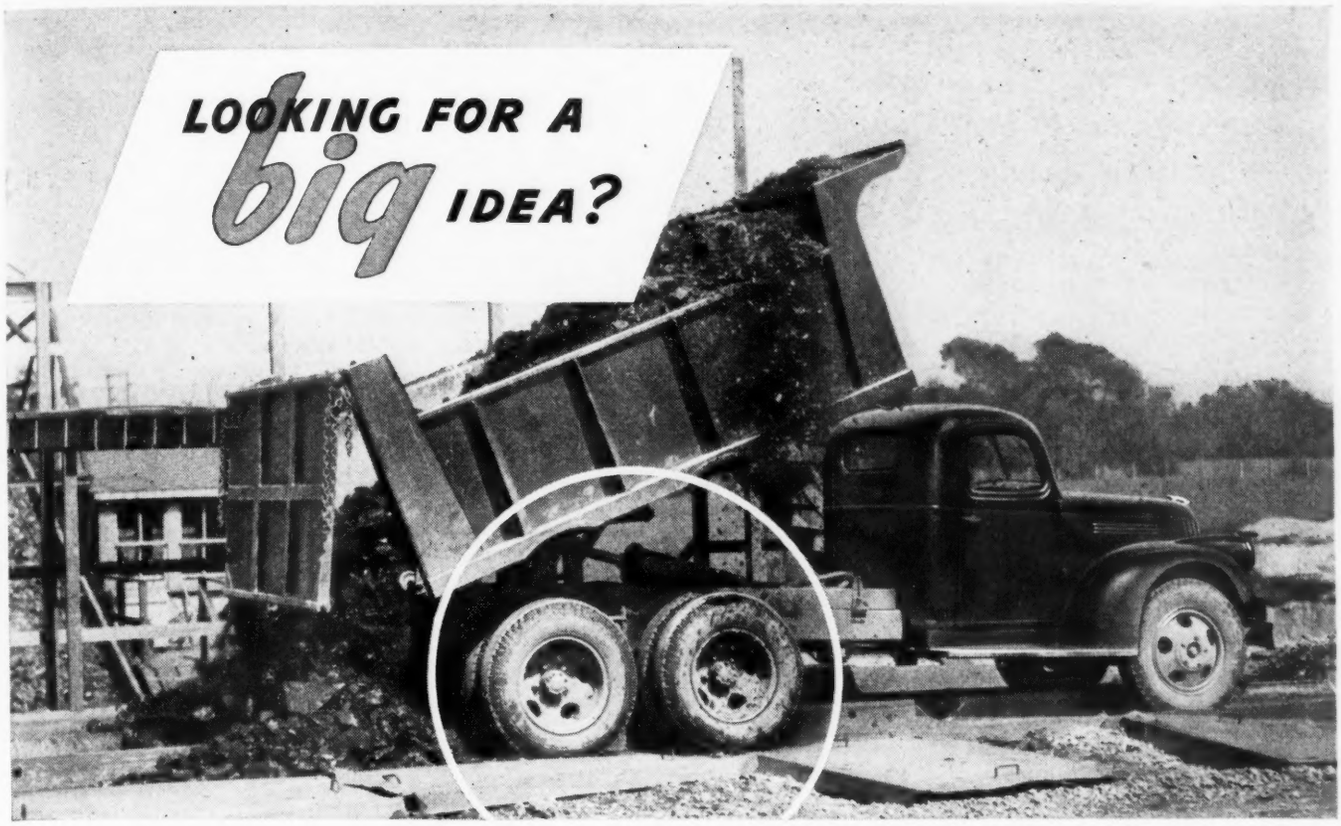
1109

OFFICE OF GENERAL DISPOSAL

WAR ASSETS ADMINISTRATION

GOVERNMENT WAA SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati Cleveland • Denver • Detroit • Grand Prairie, Tex. • Houston • Jacksonville • Kansas City, Mo. Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha Philadelphia • Portland, Ore. • Richmond • St. Louis • San Antonio • San Francisco • Seattle • Tulsa



Here's one that assures BIG Payloads and BIG Savings.

It's the Thornton 4-rear-wheel Drive. And it converts your medium-duty coal truck to a heavy-duty, six-wheel hauler—without the heavy-duty cost!

Trucks with a normal G.V.W. of 15,000 to 16,000 lbs. are boosted to heavy-duty haulers with a G.V.W. of 26,000 to 32,000 lbs. as a truck . . . 42,000 to 44,000 lbs. as a tractor. In addition, this conversion unit enables your trucks to carry heavier loads in strip mining operations as well as general coal-hauling work.

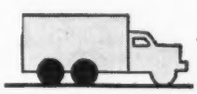
The Thornton 4-rear-wheel Drive includes a two-speed gear case assembly with a NoSPIN Differential. This famous automatic-locking differential assures positive drive at all times. A NoSPIN Differential can also be installed in each driving axle to prevent wheel-spin.

You also get an extra driving axle, to give you two instead of one—plus two extra wheels, four extra tires, heavy-duty "walking-beam" springs, necessary frame reinforcements and attaching parts. And because your load is spread over eight tires instead of four, you get far better flotation.

For full details call your truck dealer or local Truckstell distributor. Or send coupon below. The Truckstell Company, Union Commerce Bldg., Cleveland 14, Ohio.

THORNTON 4-REAR-WHEEL DRIVE

Converts a Medium-duty Truck

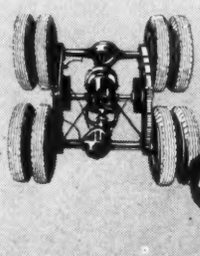


. . . into a Big, Powerful Six-Wheeler

RESULT: 100% More Payload
100% More Tractive Effort

THE NoSPIN DIFFERENTIAL used in the Thornton 4-rear-wheel Drive will also increase the efficiency of *4-wheel* trucks. Fits virtually any driving axle. Prevents wheel-spin . . . keeps trucks from stalling in mud, muck, sand, snow . . . on ice or slippery roads.

FREE! Send for your free copy of new illustrated folder. Tells how the Thornton 4-rear-wheel Drive will help you solve your problems.



THORNTON 4-REAR-WHEEL DRIVE

Approved and Distributed by TRUCKSTELL
SPECIALIZED EQUIPMENT FOR PLUS PERFORMANCE

Mfd. by DETROIT AUTOMOTIVE PRODUCTS CORP.
(Formerly Thornton Tandem Company) DETROIT, MICH.

The Truckstell Company, Dept. CA-5
1274 Union Commerce Bldg., Cleveland 14, Ohio

Yes . . . I want to know *more* about the Thornton 4-rear-wheel Drive, and how it will enable my_____(make) trucks to earn more money. Please send free folder and name of nearest Truckstell distributor.

Name.....

Address.....

City.....Zone.....State.....

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MECHANICAL FEED HORIZONTAL DRILL.

Ten years of field test has proven that our power-feed design of direct, transmission and worm gearing with two-speed control will not only cut shot hole drilling time in half but also eliminates costly maintenance delays. V-belt drive to the power-feed with an additional ample clutch in that assembly gives absolute control of a drilling speed of two to three feet per minute with a retrieving speed of twenty-four feet per minute.

The Parmanco Horizontal is adapted to all forms of highwall drilling, will handle a six-inch auger up to a distance of sixty feet or more and, by use of our patented augers with interrupted flights and secondary cutters, will drill an absolutely clean hole with a minimum of torque. It permits the drilling of a controlled-angle hole which makes possible a great saving of explosives through the cantilever effect of this controlled-angle drilled hole.

EFFICIENT STRIPPING STARTS WITH EFFICIENT DRILLING

PARIS MANUFACTURING COMPANY
PARIS, ILLINOIS

Keep your conveyor belts going with
FLEXCO
HD BELT FASTENERS

• **FLEXCO H D RIP PLATES** are used in repairing rips and patching conveyor belts. The wide space between outer bolts gives the fastener a long grip on the edges of the rip, while the center bolt prevents the fasteners from bulging.

• Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco HD belt fasteners and rip plates. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

• **FLEXCO H D BELT FASTENERS** make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco HD Belt Fasteners. Also illustrates step by step the latest practice in repairing rips and putting in patches.

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FLEXCO HD BELT FASTENERS
Sold by supply houses everywhere

Since 1835 . . .

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LOADED IN 3 MINUTES

LOADS
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POURS

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Scoopmobile, with a level bucket load capacity of 1.08 cubic yards can *easily* load 2 tons in 3 minutes. This is only *one* of its *many* uses. Coal, gravel, sawdust, snow, lumber . . . or most any movable material . . . can be handled with speed and ease. Attachments (quickly changed by *one* man) are designed to fit your various needs. With the standard track, load can be discharged at any point up to 7¾ ft. Extensions available to raise discharge height to 17¾ feet.

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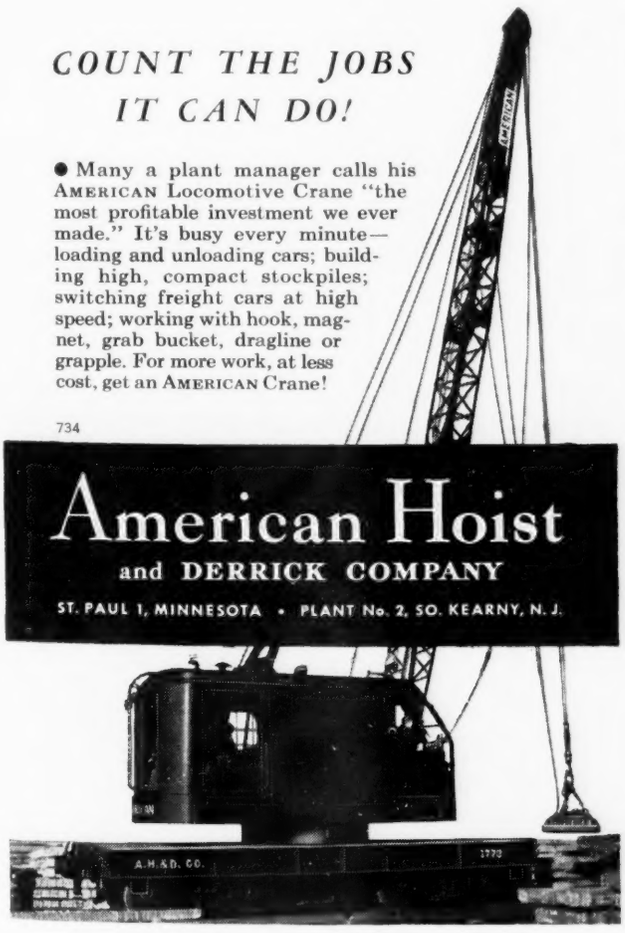

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ST. PAUL 1, MINNESOTA • PLANT No. 2, SO. KEARNY, N. J.

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The SUTTON No. O IMPROVED SAND DRYER includes all the time-tested principles that have made SUTTON STANDARD Sand Dryers a favorite for over forty years, **plus** many improvements to give you even better results. Write for catalogs, prices.

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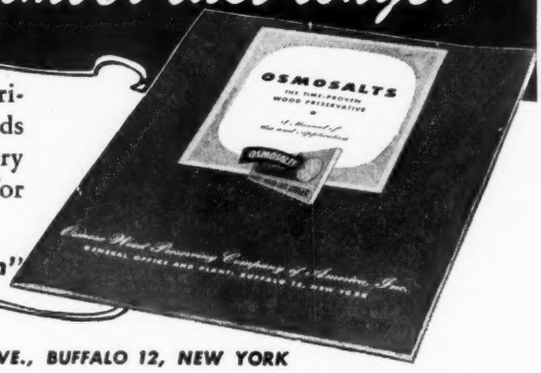

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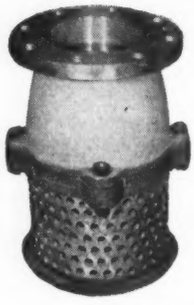
No backflow
No water hammer



Flapper opening completely allows smooth un-impeded flow of water but closes instantly preventing back flow and water hammer. Made of acid resisting bronze in flanged, threaded or combination types. Order should specify size of pipe and type desired. Strainer has considerably more inlet area than that of pipe.

OVERALL DIMENSIONS

Size	Height	Maximum Diameter	Weight
2"	6⅜"	6½"	17 lb.
2½"	9"	8"	20 lb.
3"	9⅛"	8"	20 lb.
4"	10"	8¾"	30 lb.
5"	12½"	11½"	55 lb.
6"	13½"	11½"	70 lb.
8"	13-13/16"	16⅛"	130 lb.
10"	13-13/16"	16½"	140 lb.

Prices upon application

FLOOD CITY BRASS & ELECTRIC CO.
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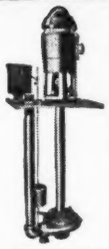
You'll Find EXTRA SATISFACTION in PUMPS "by Aurora"

No matter how exacting your requirements, there is a size and type of Aurora Centrifugal or Apco Turbine-Type Pump to handle it PERFECTLY. Products of experience. Built by exclusive makers of fine pumps.



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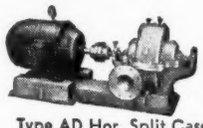
Aurora Deep Well Turbines for all conditions—4" to 24"



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Type OD Hor. Split Case Double Suction Single Stage Centrifugal

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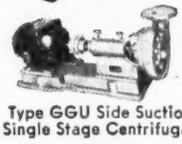
Apco Turbine-Type Pumps The simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.



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APCO Horizontal Condensation Return Unit

APCO Single Stage Turbine-Type

Write for **CONDENSED CATALOG M** or See Our Catalog in SWEETS.

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Operates Switch Safely • Saves Time and Money

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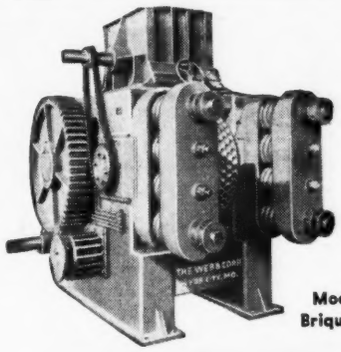

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Briquette Press

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For Coal and Other Materials

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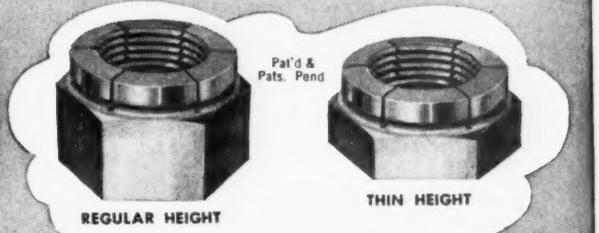

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"Flexloc" packs maximum usefulness in minimum space because it is rugged, locked, compact—and is therefore, becoming increasingly popular and this applies alike to U.S.S. and S.A.E. thread series.

Every thread—including the locking threads—takes its share of the load.

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Being a "stop" nut, it stays locking in any position on a threaded member.

"Flexloc" Thin Nuts are especially popular, because their tensile is so high.

Sizes from #6 to 1" in diameter—millions in use!

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9000 ACRES coal, 3' to 4', open mines, low cover strip jobs, 4 seams workable, ready for large and small operations, hard roads, available sidings, situated in Bell, Chest, Burnside and Furgison Townships, Clearfield Co., Pa. Call Edward Haupt, Owner, Bellefonte, Pa.

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Suitable for strip mining. Complete details upon request.

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In stock—Various locations

1—Slate Larry with 2 HM-819-L Motor Units, Ball Bearing, 42" Track Gauge, Large Hopper
1—13 Ton Jeffrey Locomotive with 2 MH-110 Ball Bearing Motors, Glass Insulated Armature and Field Coils
1—12-AA Goodman 6½' Cutter Bar and Chain (No. 42)
1—HM-809-L Motor Unit 250V for 13 Ton Gen. Elec. Locomotive
1—13 Ton General Electric Locomotive, 36-44 Track Ga., 5" Armor Plate Frame on Outside, HM-827 (76 HP) Ball Bearing Motors
1—10 KVA Transformer 2300-110-220
30—Tons Steel Rail—30, 35 and 40#
1—Railroad Car Puller with Conical Drum
1—No. 159 Reel Motor for Jeffrey Floating Type Cable Reel 250V
1—5 HP Single Phase General Electric Repulsion-Induction Motor 1800 RPM, 110-220 Volt
1—10 HP KT General Electric Motor, 220-440 Volt, 3/50/1200 RPM
1—20 HP CS Westinghouse Motor, 220-440 Volt, 3/60/1200 RPM
1—Slate Larry, Standard RR Gauge, ¾ turn, with shuttle conveyor
1—300 Amp 7500V Westinghouse Oil Switch—Style 321059—Type 2-F
4—HM-801 Motor Units, Ball Bearing
ARMATURES—Jeffrey MH-78 (250 and 500V) MH-88, MH-110 (53) MH-110 (61) High Speed—C-79 Jeff Crab 7½ HP—29-B, 29-C, 35-B, 35-BB, 35-L, Goodman 36-B (13 Ton Locomotive) 12-A Machine, GENERAL ELECTRIC—HM-801, 819, 821, 839—WESTINGHOUSE 905-C and MH-88 500V Jeffrey
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COAL MINE EQUIPMENT
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5 to 10 cubic yard electric powered dragline, walker preferred, 150 to 180 foot boom, must be in good condition, needed in next few months.

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Single drum electric hoist 100 H.P. D.C. with auxiliary tail rope drum.

2—100 KW D.C. 250 volts Generators Skinner Steam engine.

1—6 ft. and 1—7 ft. Mine fan.

Ingersoll-Rand Air compressor, Imperial Type 10, compound—steam.

Located—Canfield, Ohio.

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30,000 Grade #3, 4, and 5 Creosoted, Used Ties

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¾ to 4 yard Shovels
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4½" to 6" diameter; mounted on wheels, gas engine driven, used, excellent condition only.

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ELEC. LOCOMOTIVE

New G.E. electric locomotive, Type LME-2C4-C; 2 motor, rated weight 4 tons, maximum drawbar pull 2400 lb., 30 in. track gauge, wheelbase 44 in., length 145 in., width 42 in., height above rail 38 in.; coupling single slot pocket 10½" above rail; rated voltage 125 volts; 2 headlights, sanders at four wheels. Delivered 1946. Never operated—Save 35%. Address inquiries to:

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COAL CRUSHER
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Complete with V-Belt Sheave
Excellent condition - Immediate delivery
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SHOVELING MACHINES

2—Myers-Whaley No. 4 Standard Shoveling Machines, fair condition, now being used. Immediate possession of one machine, second machine available near future.

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FOR REBUILT MINING EQUIPMENT

GOODMAN SHAKER CONVEYORS
1—Goodman G 20 Shaker Conveyor with 250 v. 20 HP motors, also Goodman #3 Duck Bills.

MINING MACHINES
35—B Jeffrey 250 v. Permissible, 7½' bar.
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2—6 Ton G.E., permissible 36/44 Ga. HM 825 BB Motors, with Edison Batteries.
4 Ton 36" Ga. Atlas 2 BB Motors.
5½ Ton Type D Ironton, 42" Ga.

Haulage & Gathering Locomotives
13 Ton Westgh. 250 v. 36" or 40" Ga.
10 Ton Jeffrey MH 110, 250 v. 36/42" Ga.
8 Ton Goodman 9104C2 Permissible Gath. 500 v. 40/44" Ga.
3—50 Ton 600 v. Std. R.R. Ga.
3—6 Ton G. E. 250 v. HM 803 Motors. 36" Ga.

COAL CRUSHERS
18x24 and 18x30 New Scottdale dbl. roll.

Rotary Con. & MG Sets (3 ph. 60 cy.)
300 KW G.E. HC 12 Rotary 275 v. 6 ph.
300 KW West. 250 v.—432 HP 2300 v. 8 PF.
150 KW Ridgeway 275 v. 900 RPM dir. con. 225 HP.
100 KW West. 125 v.—150 HP 2300 Syn.
50 KW G.E. 125 v.—75 HP West. 220/440.
3—New 10 KW 125 v.—220/440/3/60.
15 KW Cr. Wh. 250—220/440/3/60.

SLIP RING & SQ. CG. MOTORS

HP	Make	Speed	WDG	Type
1400	West.	1200	Syn.	New 1 P.F.
1000	West.	1200	Syn.	New 8 P.F.
750	West.	1200	Syn.	New 7 P.F.
450	G. E.	257	S.R.	MT
400	G. E.	514	S.R.	I-M
350	G. E.	900	S.R.	I-M
300	West.	1800	S.R.	CW
250	West.	277	S.R.	CW 1314
225	West.	585	S.R.	MW
200	Cr. Wh.	505	S.R.	
200	G. E.	240	S.R.	MT 412
200	West.	350	S.R.	CW
100	Cr. Wh.	700	S.C.	
100 (3)	West.	680	S.C.	CS
100	West.	1750	S.R.	C-I
100	G. E.	500	S.R.	M 1-25-cy.
50	Cr. Wh.	505	S.C.	
50	West.	580	S.R.	CW 658 D
50	G.E.	900	S.R.	I-M
40	G.E.	900	S.R.	MTC
35	West.	870	S.C.	CS

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400 HP Vulcan conical drum Shaft Hoist driven by 400 HP G.E. slip ring 440/3/60 with rev. mag.
400 HP Vulcan Slope Hoist—AC Motor.
2—Fairmont Car Retarders.
10 Ton Larry Car 500/250 v. DC.
2—50/75 HP 2 drum Meade Morrison slope.
75 HP Ottomwa slop with AC Motor.
75 HP Vulcan 2 drum shaft. S.R. Motor.
40 HP Lidgerwood sgl. fr. drum geared to 40 HP G.E. slip ring 20/440 v. 3 ph. 60 cy. MTC. Rev.
30 HP Carlin double dr. fr. 13"x18"—5½" flgs.
2—1 Ton AC Monorail 220/3/60.
4—2720 GPM 85' Le Courtney Bronze fitted 10" Cent.
1—700 GPM 60' Wheeler Bronze Fitted 5" Cent.

DC MOTORS GENERATORS, 230/250 v.

HP	Make	Speed	Wdg.	Type
200	Cr. Wh.	500	sh.	CM
175	G. E.	475	ser.	MD 109
130	G. E.	550	ser.	CO 1812
100	G.E.	480	ser.	MD 108
50	Northern	600	ser.	K
50	West.	565	cp.	SK 500 v.
50	West.	250/1000	sh.	SK
50	Reliance	1750	cp.	166 T
40	G.E. (Vert)	1750	cp.	CD 93
40	Roth	1500		
35	Cr. Wh.	700	sh.	CM
35	Cr. Wh.	950	sh.	CM
25	West.	825	cp.	SK 113
20	West.	750		
20	West.	600	ser.	K6
15	West.	600	ser.	K5
15	West.	850	cp.	SK 93
15	Wh.	800	sh.	CM
15 (4)	C. Wh.	1400/1700	sh.	CM
13	West. (Enc.)	825	cp.	SK 113
10 (2)	G.E.	1750	sh.	CD
7½	G.E.	1750	sh.	RL

AIR COMPRESSORS
1200 cu. ft. 100# Worthington 2 stage Belted.
3—373 cu. ft. 100# Bury—AC Motors.
173 cu. ft. 100# Pres. Chic. Pneu. Belted
90 cu. ft. 100# Pres. Chic. Pneu. Belted.
75 cu. ft. 100# Chg. Pneu-AC Motor.

DC MAGNETIC STARTERS
New 200 v. DC Magnetic Cutler Hammer. Starters, 20, 25, 40, 50, 60, 75 & 100 HP.

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Serving the Coal Industry for more than a Quarter of Century

MINING MACHINES
AC or DC
REBUILT & GUARANTEED
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COAL CRUSHERS
Single & double roll.

Electric Coal Drills, Mine Fans, Vibrating Screens, Electric Generators, Motors, etc.

CONVEYORS — Belt and Drag. Also gravity conveyors, bucket elevators, etc.

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(Established 1902)
910 First National Bank Bldg.,
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Warehouse: Carnegie, Pa.

CUTTING MACHINES
1—12 AA, 50 HP Goodman Universal machine, with or without truck.
1—CE-7 Sullivan with or without truck.

LOCOMOTIVES
1—G.E. HM-827, 500 V., 44" ga.

SUBSTATIONS
1—Armature and stator for 150 KW Ridgeway.
8—Westinghouse 300 KW Rotary Converters, 6 phase, 60 cycle, 300 or 600 volt. DC. 500 Amps. 1200 RPM, complete with switchboard panels.
1—100-KW G.E. M-G set complete, 275 volt D.C. 2300 A.C.

HOISTS
1—200 HP Lidgerwood Hoist.
3—50 HP All Steel Hoists.

MISCELLANEOUS
1—5 ft. Jeffrey dies. fan, new condition.
1—35-HP Cargo winch complete with 230 volt D.C. Motor.
1—100-HP. Reeves Natural gas engine with 62.5 KVA G.E. alternator, 220 volt with complete switchboard equipment.
1—400-Amp. Lincoln welding machine with D.C. drive. 230 volt.
2—500 volt Goodman 212-AA cutting machine armatures.

A.C. and D.C. Stationary Motors, Starters, Transformers and Miscellaneous mine supplies.

We solicit your inquiries

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All sections of rails and good serviceable second hand cars, all gauges, also spikes, bolts, frogs, switches and ties.

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RELAYING RAIL
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PLATES, BOLTS, SPIKES
1000 tons 90# ARAB • 525 tons 90# ASCE
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55,000 Used Lundie type tie plates for 70# to 100# rails
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FOR SALE

Frank J. Wolfe

LOADING MACHINES
8—11-BU Joy, 250 volt DC, 42" gauge.
5—8-BU Joy, 250 volt DC, 42" gauge.
5—7-BU Joy, 250 volt DC, 42" gauge.
7—L-400 Jeffrey, 250 volt DC, 42" gauge.
3—#3 Myers-Whaley, 250 volt DC.

MINE CARS
200—3-ton all steel end dump, 27" high, 42" gauge, Timken roller bearing.
500—4-ton rotary dump, 42" gauge, Timken roller bearing.

LOCOMOTIVES
3—13-ton Goodman, type 136-B, 250 volt DC.
2—13-ton Westinghouse, type 908-C, 250 volt.
2—8-ton G. E., type HM-822, 250 volt DC.
8—6-ton Goodman, type 33, 250 volt DC.
6—6-ton G. E., type HM-803, 250 volt DC.

CUTTING MACHINES
5—29-LE Jeffrey, 250 volt, track cutters.
4—35-B Jeffrey, 250 volt DC, 42" gauge.
15—112-AA Goodman Universal, 250 volt, on tip-turn trucks, cable reel and cable.
8—7-B Sullivan Shortwall, 250 volt, on tip-turn trucks.
10—Jeffrey 24-L, 250 volt, permissible type longwall. Five years old.
6—12-CC Goodman Shortwall, 250 volt DC.

We will soon have to offer all the equipment from a 5000-ton mine, including Motor Generator Sets, Rotary Converters, Steel Tipple, Electric Hoists, Mine Cars, Copper wire and Rail. Other items too numerous to mention.

We specialize in buying complete mines that are going out of business or from receivers in bankruptcy, administrators of estates, etc.

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FLORENCE MACHINERY & SUPPLY COMPANY
REBUILT COAL MINING EQUIPMENT

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100—1 Ton R. B. Card, 36" Ga.
74—1 Ton P. B. Card, 36" Ga.

LOADERS
1—Manierre Type Box Car Egg Loader
1—7-BU Joy Loader, 250 Volts DC

SHAKER SCREENS
1—Double Deck, Lower deck 8'x28', upper deck 36"x40'

COAL CUTTERS
3—Sullivan CE-7 A.C. Coal Cutters, with Tip-Turn Trucks, with new Bowdil Cutter Chains and Feed Chains.

GENERATORS
1—100 KVA West. Syn. Motor, 2300 Volts AC
1—96 KW, 2300 Volts AC, direct connected to a 14x17 Chuse Engine
1—25 KW Crocker-Wheeler, 250 Volts DC
1—15 KW Ft. Wayne, 480 Volts AC
1—125 H.P. West. Syn. Motor, 2,200 Volts AC

HOISTS — ELECTRIC
1—#6½ Vulcan All Steel, without Motor
1—25 H.P. H&B Electric Hoist, with Motor
1—50 H.P. Hoist, with 250 Volt DC Motor

STEEL BINS
2—10'x20'—3/16" Steel
1—16'x24'—Sectional—¼" Steel

PUMPS — TRIPLEX
2—3½x4 Deming
2—4x6 Deming
2—5x6 Deming

MISCELLANEOUS
Safety Switches—30 Amp. to 400 Amp.
Fire Extinguishers
3—37½ KVA Pittsburgh Transformers, 440—110/220 Volts
1—6-Ton Trolley Locomotive
1—8-Ton Trolley Locomotive
1—All Steel Totally Enclosed Bucket Elevator, 28' Centers—Motorized. New and Used Motors, 3 Phase, Single Phase

We have a complete stock of practically everything

904 Equitable Bldg. — **Denver 2, Colorado**

Yards: Denver and Florence, Colorado

VIBRATING SCREENS CRUSHERS — SCALES

Immediate Shipment

3'x6'—1 deck Vibrat. Screen	$495.00
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Stoker Coal Crusher	395.00
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15 Ton Truck Scale	450.00
20 Ton Truck Scale	510.00
5 Ton Tipple Scale	260.00

Many types of conveyors.

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2190 S. Third St., Columbus 7, Ohio
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Visit our factory. We manufacture more than 150 models of Scales, Screens, Crushers, and Conveyors. Inspect several models in operation.

NEW and REBUILT
STORAGE BATTERY
LOCOMOTIVES
1½ to 10 Ton 13" to 56" Track Gauge
GREENSBURG MACHINE CO.
Greensburg, Pa.

AIR COMPRESSORS:
12—Belted 360, 676, 870, 1000, 1300 ft.
12—Diesel 105, 315, 520, 676 & 1000 ft.
6—Electric 1300, 1500, 2200, 5000 ft.

CARS & LOCOMOTIVES:
100—50 ton cap. Gondolas.
35—50 ton cap. Flat Cars.
4—35 & 65 ton Diesel Locomotives.
6—10, 16, 20 & 30 ton Gas Locomotives.
150—8000 & 10000 gal. cap. Tank Cars.
20—12 yd. Std. ga. Steel Dump Cars.
1—50 ton G.E. Diesel Elec. Locomotive.

RUBBER CONVEYOR BELTS:
1000', 60", 600', 30", 300', 20", 1000', 42", 900', 48", 1450', 36", 1200', 24", 900', 18", 600', 16", 350', 14".

ELECTRIC LOCOMOTIVES:
15—3, 5, 8 ton Battery & Trolley.

DIESEL GENERATORS:
12—100, 150, 180 & 480 KW.

MINE LOADERS:
17—GD9, Elmco 21, Conway 20, 50, 60 & 75 and Sullivan HL3.

STEEL TANKS:
30—8000, 10,000 & 20,000 gallon capacity.

SHOVELS — DRAGLINES:
7—1 yd., 1½ and 2 yd. Gas & Diesels.
16 yd. Elec. 160 ft. Boom Dragline.

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TYPE SK—MOTORS
America's Best Stock
WIRE INQUIRIES COLLECT
MOTORS, GENERATORS, TRANSFORMERS

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Bought and Sold New and Rebuilt
ELECTRIC EQUIPMENT CO.
Rochester 1, N. Y.

FOR SALE
COOPER BESSEMER DIESEL GENERATOR
6 Cylinders—720 RPM
General Electric—200 KW, 600 Volt DC
Serial No. 1313

ROCHESTER IRON & METAL CO.
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P. O. Box 565 — **Rochester, N. Y.**

WIRE ROPE FOR SALE
Brand New—Ind. Wire Rope Center, 1¼" dia. 6x19. Plow steel. Various lengths from 160 ft. to 3,000 ft. each reel. Also other sizes. Send for list.

TERRY WYNN
Box 118 Wash. Bridge Sta., N. Y. C.

HYDRAULIC WHEEL PRESSES
400 Ton—Niles B-P Hydraulic Wheel Press
300 Ton—Southwark Hydraulic Wheel Press
Immediate Shipment

Arthur S. Partridge
Railway Exchange Bldg., St. Louis (1), Mo.

REBUILT EQUIPMENT—READY TO SHIP

MOTOR GENERATOR SETS

1—200 KW. 690 rpm. 250/275 v. DC compound wound Crocker Wheeler Generator direct connected to 220/440 v. or 2200 v. 3 ph. 60 cy. motor.

1—175 KW. 250/275 v. compound wound 1200 rpm. G. E. Generator direct conected to a 3 ph. 60 cy. 440 v. 1200 rpm. Westinghouse induction motor.

1—150 KW. 720 rpm. 250 v. DC compound wound interpole type CD G. E. Generator direct driven by 1—2300 v. 720 rpm. 3 ph. 60 cy Elliott Ridgway synchronous motor.

1—150 KW 500 v. compound wound Ridgway Generator 273 amps. 900 rpm. direct connected to a 225 HP. 2200 v. 3 ph. 60 cy. Ridgway synchronous motor.

1—30 KW. 125 v. 825 rpm. type S generator direct connected to a 50 HP. 825 rpm. type S 500 v. motor.

PUMPS

1—11 GPM 460 ft. head Worthington Oil Pump.
1—60 GPM 479 ft. head Gould Pump.
1—100 GPM 50 ft. head Dayton Dowd Pump.
1—130 GPM 50 ft. head Dayton Dowd Pump.
1—160 GPM 50 ft. head Dayton Dowd Pump.
1—220 GPM 231 ft. head 3½"x3" Blackmer Pump.
2—243 GPM 100 ft. head Dayton Dowd.
1—300 GPM 90 ft. head Dayton Dowd Pump.
3—378 GPM 44 ft. head Dayton Dowd.
1—450 GPM 104 ft. head Dayton Dowd Pump.
1—500 GPM Morris Machine Wks. 4" sucs. 4" dis. 123" head 1760 rpm.
1—550 GPM 88 ft. head Dayton Dowd Pump.
3—750 GPM 70 ft. head Dayton Dowd Pumps.
1—1000 GPM 45 ft. head Allis-Chalmers Pump.
1—1500 GPM 90 ft. head Allis-Chalmers Pump.
1—3500 GPM 90 ft. head DeLaval Pump.
1—4000 GPM 138 ft. head Ingersoll Rand Pump.

230 V. DC MOTORS

HP	Make	RPM	Type
1	Westg.	865	CD
3	Westg.	1725	SK
5	Westg.	850	SK
5	Westg.	400	SK
7½	Westg.	975	S-3
7½	Westg.	850	SK
8	G. E.	950	RC-11
10	Westg.	1750	SK
10	Westg.	850	SK
10	Westg.	650	S
10	Cr. Wh.	825	CM
10	Cr. Wh.	675	CCM
13	Cr. Wh.	1100	CM
13½	Al. Ch.	700	
15	Reliance	1150	...
15	G. E.	1100	CE
15	Al. Ch.	800	
15	Westg.	560	S-7
20	Westg.	975	S
20	Westg.	1100	SK
20	Westg.	600	M
25	G. E.	650	MD
30	Westg.	700	S-6
40	Westg.	625	MC
75	Ideal Elec.	1200	AT
80	Westg.	450	76-A
175	G. E.	450 or 550	MD
200	Cr. Wh.	600	...
200	Cr. Wh.	600	CCM
250	.....	850	...
400	Westg.	150	...

CONVEYORS

4—G-20 Goodman Shaker Conveyors each with a Goodman Duck Bill complete with motor equipment with 250 v. DC motors.

ALTERNATING CURRENT MOTORS

3 ph. 60 cy.

HP	Make	Type	Volts	RPM
30	G. E.	KT—Sq. Cg.	400	900
35	G. E.	I—Slprg.	220/440/2200	865
40	Westg.	CCL—Sq. Cg.	440	900
40	G. E.	KT—Sq. Cg.	220/440	1200
50	Cr. Wh.	Sq. Cg.	440/220	505
50	Lincoln	—Sq. Cg.	220/440	1050
60	G. E.	I—Sq. Cg.	220/440/550	320
60	Westg.	CS—Sq. Cg.	440	690
75	G. E.	I—Sq. Cg.	220/440/550	340
100	Westg.	CS—Sq. Cg.	440 v.	690
100	Westg.	CW—Slprg	220	480
125	Westg.	CS—Sq. Cg.	440/220	900
150	Cr. Wh.	Sq. Cg.	440	1200
175	El't Rgwy	Sq. Cg.	2300	720
200	Westg.	CS—Eq. Cg.	220/440	1200
200	Cr. Wh.	SR—Slprg.	440/220	505
200/250	Westg.	CW—Slprg.	220/440	1800
300	Allis Chal.	AR—Sq. Cg.	2300/440/220	1800
Note: LARGE STOCK OF SMALL MOTORS—AC and DC.				
100	Elm-Welschel	31-V-RN Sq Cg.	220	900
400	Westg.	CW—Slprg.	2200	435
450	Cr. Wh.	SR—Slprg.	2300	392

COMPRESSORS

2—315 CFM Ingersoll Rand portable 100± pres. driven by 105 HP Waukesha Oil Engines, 860 rpm.

DUQUESNE ELECTRIC & MFG. CO., PITTSBURGH (6), PA.

IRON and STEEL PIPE
New and Used
Large stocks, all sizes
attractive prices
L. B. FOSTER COMPANY
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PIPE—MACHINERY—GAS ENGINES
AIR COMPRESSORS—DIESELS—PUMPS
Some Steam Engines and Boilers available only slightly above the metal price
BRADFORD SUPPLY COMPANY
WAYNE, WOOD COUNTY, OHIO Near Toledo

FOR SALE

CRUSHERS

1—Stephens Adamson 30 x 30 double roll crusher. Will crush from 20" down to 1¼".

1—Link Belt 36 x 60 double roll crusher equipped with gear drive.

1—24 x 36 McNally Pittsburg crusher, single roll, #9-36-335, maximum feed size 16", capacities 100 TPH 1¼", 190 TPH 4", 290 TPH 8".

FAN

1—Bayley #17 Plexiform fan, type F, wheel diameter 93½", circumference 24.478 ft. outlet area 39.376 sq. ft. Capacity ranges from 39376 CFM at outlet velocity of 1000 to 141750 CFM at outlet velocity of 3600.

HOIST

1—Ottumwa silent chain drive hoist, drum inside face 30", inside flange 7", drum diameter 36", 90 teeth on big gear, 25 teeth on pinion gear, overall length 7' 9", overall width 9', overall height 5' 6", complete with 40 hp General Electric slip ring motor, 3 phase, 60 cycle, 220 volts, 900 rpm, with reversible controller and resistance. Rope speed 290' per minute. 130 teeth on chain drive gear, 16 teeth on motor pinion.

LOCOMOTIVES

1—4 ton Goodman locomotive, type 75AO4T, #5050, overall length 15' 10" width 47", height 32", wheelbase 44", gauge 28". Gauge can be changed to 24", or 42". Ball bearing motors and journals, 250 volts, DC, continuous strip grids, equalizers, and spring bumpers.

1—5 ton Goodman locomotive type W-1-2A5, #963 overall dimensions, length 11', height 30", width 47", wheelbase 31", 42" gauge.

1—5 ton General Electric locomotive, classification LM-2T5-DD, serial number 6274, 250 volts DC, 36" gauge, 45" wide overall, 30½" frame height, overall height 36", 44" wheelbase, 24" wheel diameter, 12'6" long bumper to bumper, R86E type controllers.

1—6 ton General Electric locomotive, classification LM-2T6-MM5, serial number 5837, 250 volts DC, 36" gauge, 45" wide overall, 33" frame height, 38½" overall height, 44" wheelbase, 30" wheel diameter, 13' long bumper to bumper, R86E type controllers.

1—6 ton Goodman locomotive #4976, type 13314T, 250 volts, ball bearing motors, 42" gauge, wheelbase 44", length 14', width 54", height 35½".

PUMPS

2—Gould pumps 6 x 12, #506477, fig. 1531, 4" suction, 4" discharge, with 7½ HP motors, 175 ft. head, 114 gallons per minute.

1—Gould Centrifugal pump 3" suction, 2" discharge, capacity 225 GPM, at 105' head, complete with 10 HP Westinghouse motor, 3 phase, 60 cycle, 220/440 volts, 1750 rpm, and magnetic starter.

MINING MACHINES

1—Sullivan shortwall mining machine CE7, AC, 3 phase, 60 cycle, 220 volts, 44" gauge, 6½ ft. cutter complete with tip turn truck.

2—Sullivan Longwall mining machines, 3 phase, 60 cycle, 220 volts, AC, type CH8, 30" cutter bars, complete with 300 ft. each of 3 conductor mining machine cable.

We are distributors for John A. Roebling Sons Company wire rope and fittings.

GAVENDA BROTHERS
CANTON, ILLINOIS

LOCOMOTIVES

Goodman: All 250 volts.
1—6 ton, 30B, 43" 1—5 ton.
1—5 ton, W-1-2, 36".
2—5 ton, 2600 K.
2—6 ton, 33-1-4-T.
2—8 ton, 32-1-4-T.

Westinghouse: All 250 volts.
1—4 ton 902, 48" with crabs.
4—904 c. 44" 500 volts and 250 volt. Also 906 motors and 102-904-115.
Bar steel frames 10 ton, 6 ton, and 4 ton.

G.E.: All 250 volt
6 ton 803, 44" as is
6 ton 823, 44"
6 ton 801
8 ton 839
4 ton 1022, 44", as is
5 ton 825, 44" & 36"
8 ton 839 motors
Battery Locomotive, Ironton, Whitcomb and 1½ ton Mercury.

Jeffrey: 6 ton and 4 ton, all gauges. 250 volt. 8 ton, 250 and 500 volts, 10 ton, MH78, 500 volts.

MINING MACHINES

Jeffrey: 28A, 250 V, 4—29B, 29C, 29CE with shearing head. Also 1 on cats. Revolving head for 29C.

Goodman: 12A, 12AB, 12AA, 512, 12G3A, 424, 24B, 124E3.

1—12G3, 220 volt and 2—142 DA, 500 volt.

2—Permissible Type 12CA. 6—112AA. Motors for 212AA, both 250 and 500 v.

1—Hitch Cutter for Cross Head timbers.
Sullivan: CE7, CE9, CE10, CR10 Low Vein.

SUBSTATIONS — 275 volts, D. C.

1—150 KW **G. E.** MG Set.
1—300 KW **Westing.** Rotary.
1—150 KW **West.** MG Set.
1—100 KW **Westinghouse** M-G Set.

SPARE ARMATURES

Jeffrey MH 110, MH 78, MH 73, and MH 64-350 Volts and 500 V. 29B, 35B and 28A. **Goodman** 34B, 30B, 30C, 12A, 2600 K and R; 12AB, 12AA, 33-1-4-T, 31-1-4-T, 32-1-4-T. **General Electric** 801, 803, 807, 819, 821, 825, 839. **Westinghouse** 904, 905, 906, 102, 907, YR2, 115. Also 200 KW **Westinghouse Rotary Converter Armature,** 250 V Bracket Type, 150 KW G.E., HCC Bracket Type. **Sullivan** CE7, CE9 and CE10.

AERIAL TRAMWAYS • HOISTS • PUMPS • MOTORS • TRANSFORMERS • BOND WELDERS • RESISTANCE • COMPRESSORS • DUPMS • SPEED REDUCERS • FIELD FRAMES • MOTOR STARTERS AND CONTROLLERS—AC & DC • DROP BAR SUPPORTS (Gooseneck), 29B and 29C • MINING MACHINE TRUCKS • SWITCHBOARDS • CIRCUIT BREAKERS—AC & DC • COAL CRUSHERS (double roll) 16"x16", (single roll) 24"x36", 24"x24", 36"x36", 30"x60", 30"x30", 18"x18" •LATHES, SWICHES • AUTOMATIC CIRCUIT BREAKERS 250 volt 600 amps to 2000 amps • MANUAL CIRCUIT BREAKERS 600 amps to 3000 amps • HOISTS, overhead, AC 3-60-440 1 ton and 2 ton • 1 clam shell bucket 1¾ cubic yard • MINE CARS • 2 SULLIVAN BIT SHARPENERS • R. R. SWITCHES 85± to 100± GENERATORS DC 250-275 volt, 30 KW to 100 KW. • Also SPARE MOTORS DC and AC for mining machines and locomotives. BELT CONVEYORS, SLATE LARRY, 2—5BU on Cats. 18BU on Cats. 2—Myers-Whaley, ±3 and ±4. LOADING MACHINES and Goodman Shaker Conveyors and Duckbills. PLANTS, 50 KW to 250 KW. 4—WESTINGHOUSE 55 KVA Rotary Transformers, Voltage 23100/208 and Synchronous Motor Starters full Magnetic Across-the-line, 3 phase, 60 cycle, 4150 Volts—2—200 H.P. and 6—250 H.P. Westinghouse.

GUYAN MACHINERY COMPANY, Logan, W. Va.

SYNCHRONOUS ROTARY CONVERTERS

Qu.	KW	Make	Speed	D.C.V.
1	500	Whse.	1200	600
1	300	Whse.	1200	275
2	300	Whse.	1200	600
1	300	G. E.	1200	600
2	175	Whse.	1200	275
1	175	G. E.	1200	275

TRANSFORMERS

1—200 KVA Kuhlman, Cont. Duty, Auto. 3800-2300/3/60.

MOTORS

1—80 HP, 1200 RPM, Cr. Wh. 220/440/3/60 Ind.
1—75 HP, 1800 RPM, U. S. Line Start 220/440/3/60 Ind. B.B.
1—65 HP, 1200 RPM, G. E. type KT. 220/440/3/60 Ind.
1—40 HP, 900 RPM, Whse. type CW, 440/3/60 Slip Ring.
5—5 HP, 2200 RPM, Reliance, Ex. Proof, 230 V. D.C.
Several Whse. type SK, 230V. DC.
A Few 5, 7½, 10 and 15 HP. New TEFC and standard open ball bearing AC motors available. Across line and reduced voltage starters.

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CHARLESTON, W. VA.

NEW and REBUILT

Converters, Motor Generator Sets, A. C. & D. C. Motors, Control Equipment and Transformers.
We build equipment to fit your requirements. Over 25 years engineering background.

MOTOR GENERATOR SETS

1—150 KW. Ridgeway, 900 RPM, 250 V. DC to 225 HP. 2300 volt. Syn. motor AC, complete with control equipment.

REBUILT MINING MACHINES

6—112 AA and 12 AA Goodman 250 Volts
1—112 G3A Goodman 222 Volts
2—12 A and 12 AB Goodman 250 Volts
4—CE 7 Sullivan A-C and D-C
2—7-B Sullivan 250 Volts

LOCOMOTIVES

1—6 ton Goodman Type 33 250 Volts
1—6 ton Goodman Type 30-13 250 Volts
2—6 ton Goodman Type 2600 250 Volts
1—8 ton Westinghouse Type 906L 250 Volts
1—6 ton GE Trolley and Battery combination
1—12 ton GE Ball Bearing 42" gauge 250 Volt

LOADING MACHINES

2—7 BU Jays 250 Volts 42" gauge
4—5 BU Jays 250 Volts 42" gauge

THOMAS GILLESPIE & SON

State Road 67, BICKNELL, IND.
Phones 179 and 149-K

STEEL TANKS

30—10,000 Gal. Cap. Horizontal.
250—4,200 Gal. Cap. Vertical.
7—42,000 Gal. Cap. Vertical.
3—5,000 & 10,000 Bbl. Cap. Vertical.

L. M. STANHOPE
Rosemont Penna.

FOR SALE

6 Goodman G-20 shakers, 6 Goodman 512 cutting machines, 1,200 feet belt conveyor, blowers, drills, car pulls, 3 75 KVA transformers, all AC, 1946 equipment. Will sell entire mine or equipment.

PERSHING FUEL COMPANY
221 Iowa Building DES MOINES, IOWA

FOR SALE

LOADING MACHINES

Two L-500 Jeffrey Loading Machines, permissible type, 250 volt D.C., 42" track gauge, immediate delivery.

FS 407 Coal Age,
330 West 42nd St., New York 18, New York

USED DIRECT CURRENT MOTORS FOR SALE

Quantity	Manufacturer	Type	H.P.	R.P.M.	Volts
4	General Electric	CVC-112	3	1100	230
1	Allis-Chalmers	Open	3	1150	230
2	General Electric	DB-232	3	1750	230
2	General Electric	BD-132	3	1750	230
1	General Electric	5B225A94	3	1750	230
2	Westinghouse	R	5	650	250
1	Allis-Chalmers	E-75	5	850	230
1	Allis-Chalmers	Open	5	575	230
1	Ft. Wayne	B	5	600	230
8	Westinghouse	SK	10	975	230
1	Westinghouse	SK	15	1750	230
11	Allis-Chalmers	E-122	25	750	230
1	General Electric		25	1150	230
2	General Electric	CO	35	650	230

All motors are subject to prior use or commitment.

Address all communications to Purchasing Agent,

The Union Pacific Coal Company **Rock Springs, Wyo.**

DIESELS

1—Buda 6—1879 cu. in. 6¾ bore x 8¾ stroke, 200 H.P. Power Unit.

1—Buda 6—468 cu. in. 4¼ x 5½ 70 H.P. Power Unit.

1—Cater Pillar D—13000, 6 cyl., 5¾ bore x 8" stroke, 110 H.P. Continuous Output.

F. L. Cusac & Associates

Board of Trade Building
Chicago 4, Ill.
Wabash 5860

ROTARY CONVERTERS

300 KW GE. SYN., 575 V., 6 Ph., 60 Cy., 1200 RPM, Pedestal Type, 2300/4000 V. Transformers and Switchgear.

150 KW WEST. SYN., 275 V., 6 Ph., 60 Cy., 1200 RPM. Pedestal Type, 2300/4000 V. Transformers and Switchgear.

MOTOR GENERATORS

300 KW RIDGWAY Syn. 275 V., 2200 V., 3 Ph. 60 Cy., 1200 RPM. Complete Manual Switchgear.

150 KW R. W. SYN., 275 V., 2300 V., 3 Ph., 60 Cy., 900 RPM. Complete Manual Switchgear.

150 KW G.E. SYN., 600 V., 2300/4000 V., 3 Ph., 60 Cy., 1200 RPM, Manual Switchgear.

LOCOMOTIVES

13-T WEST., 250 V. 908C Mts., 36"-44" Ga.
13-T G.E., 500 V., HM-827 Mts., 36"-42' Ga.
13-T G.E., 250 V., HM-827 Mts., 36"-42" Ga.
10-T JEFFREY, 250 V., MH-110 Mts., 36"-48" Ga.
10-T WEST., 500 V., 907-C Mts., 36"-44" Ga.
10-T WEST., 250 V., 907-C Mts., 36"-44" Ga.
8-T JEFFREY, 250 V., MH-100 Mts., 36" Ga.
8-T WEST., 500 V., 907-C Mts., 42"-46" Ga.
8-T WEST., 250 V., 906-C Mts., 42"-48" Ga.
8-T GOODMAN, 250 V., 34B Mts., 36" Ga.
6-T G.E., 250 V., HM-823 Mts., 30"-36" Ga.
6-T G.E., 250 V., HM-701 Mts., 30"-36" Ga.
6-T WEST., 250 V., 903-B Mts., 22"-30" Ga.

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1—124 E. J. Goodman Slabbing 250 V. D.C.
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1—6 Ton Jeffrey with MH88 250 V. Motors.
1—6 Ton G. E. Storage Battery Locomotive with 2 HM825 Motors.

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1—185 HP Burke SC 3/60/2200/1150.
1—150 HP Westinghouse CS 3/60/440/600 RPM.
1—100 HP Synchronous Motor 3/60/440/1200.
2—100 HP Ridgway 2 Speed Squirrel Cage Motors 720/360 RPM, 3/60/2200 V.
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2—25 KVA G. E. 1/60/2300/220/110 V.
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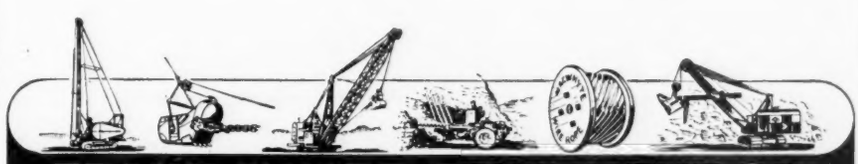

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36"	6	1/8" — 1/16"	20"	4	1/8" — 1/32"
30"	6	1/8" — 1/16"	18"	4	1/8" — 1/32"
30"	5	1/8" — 1/16"	16"	4	1/8" — 1/32"
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HAZARD WIRE ROPE 101 YEARS OLD 1846 • 1947

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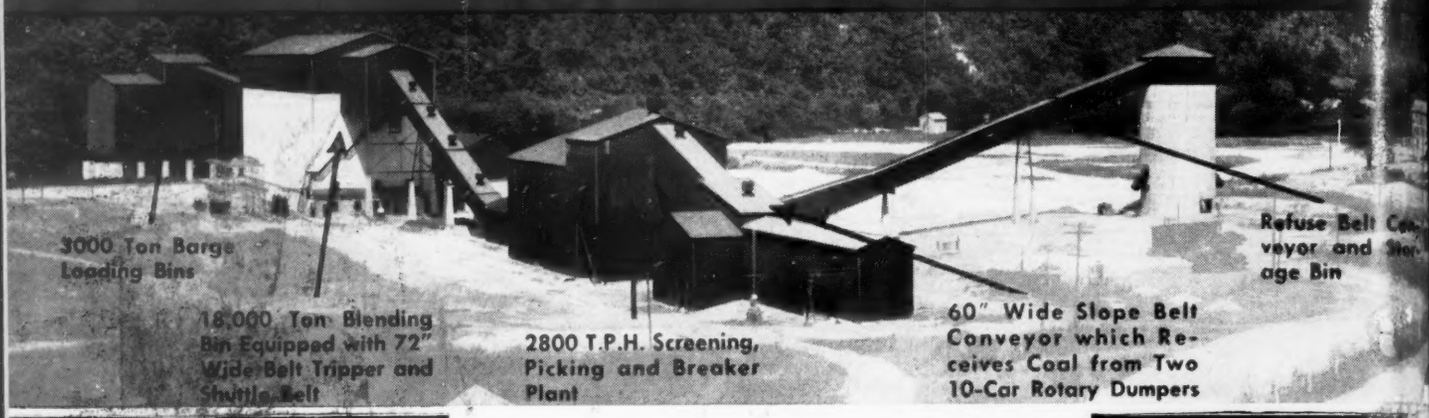
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Link-Belt offers you a complete line of equipment, broad experience, proved performance and centralized reliable responsibility in all phases of coal handling and preparation.

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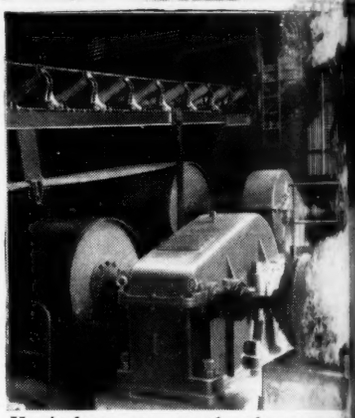
10,718



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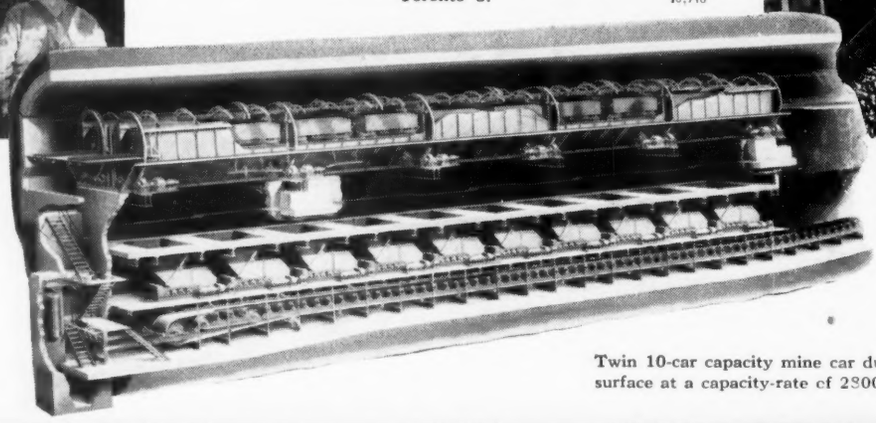
60-in. wide main slope belt conveyor taking coal out of Robena mine. Conveyor operates at a speed of 600 F.P.M. Total lift from mine bottom is 170 [illegible]

72-in. wide belt conveyor d ering coal to shuttle belt veyor which distributes it to 168 separate pockets which r up the blending bin.



Twin 10-car capacity mine car dumpers unload cars below the surface at a capacity-rate of 2800 tons of ROM coal per hour.

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

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